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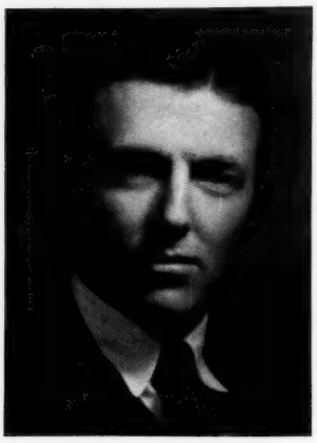
Cupola Research



THE FOUNDRY INDUSTRY in this country depends almost entirely upon the cupola for melting upwards of 7,500,000 tons of cast iron annually. This quantity is produced by some 4,000 foundries with individual daily capacities ranging from a few tons up to 2500 tons per day.

The successful operation of these cupolas depends upon knowledge relating to a number of branches of engineering, including (1) mechanical engineering pertaining to equipment, (2) metallurgical engineering pertaining to pig iron, scrap, alloys and cast iron, (3) chemical and physical chemical engineering pertaining to slags, fluxes and desulphurizers, fuels and combustion, and (4) ceramic engineering pertaining to refractories.

Including as it does such a broad scope of engineering, the field of cupola operation affords tremendous opportunities for new developments as a result of research. The benefits that can be realized as a result of such cooperative research are exemplified by the great value secured by the Association in its cooperative research on foundry sand.

It is the intention of the Association, therefore, to embark on a program of cooperative research on cupola operation. The prosecution of this program will be in the hands of the Cupola Research Committee under the Gray Iron Division. This committee as already organized is composed of some 85 of the outstanding experts who have agreed to participate in the work.

Before actual research is begun it is deemed necessary to have a correlated survey of existing knowledge in order to ascertain the places where information is lacking. The committee is organized, therefore, in groups under the following headings: 1. Equipment. 2. Ferrous Materials and Alloys, (a) Pig Iron, (b) Scrap, (c) Alloys. 3. Slags, Fluxes and Desulphurizers. 4. Fuels and Combustion. 5. Operation and Process. 6. Refractories.

These groups will approach their work in the following sequence: First, survey and study existing published data on the cupola. Second, summarize the authentic and verified data under each heading. Third, publish the findings of this survey in book form which it is believed will be of estimable value to all concerned in melting cast iron.

A further step will then consist of carrying on research work to secure data on phases of cupola operation lacking at the present time.

In carrying on this most needed survey, the committee (personnel shown on page 6) is inviting the cooperation of all who have data on any phase of cupola melting as it is realized that many have material which should be incorporated in the survey.

A. L. Boegehold, Chairman,
A.F.A. Gray Iron Division
Committee on Cupola Research.

A. L. Boegehold, chairman of the Gray Iron Division Committee on Cupola Research, is head of the metallurgical department of the General Motors Research Division at Detroit. Mr. Boegehold is one of the foremost research workers in the field of cast iron, has served for several years on the Gray Iron Division Advisory Committee and has presented outstanding research papers before the A.F.A. and other technical societies.

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American Foundryman

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Industry's Responsibility to Youth

By C. E. Wilson, Detroit, Mich.

Charles Erwin Wilson who presented the accompanying address as the Board of Awards lecture before the 44th annual convention of the Association is executive vice president, General Motors Corporation. A graduate of Carnegie Institute of Technology in 1909, Mr. Wilson first became connected with the General Motors Corporation in 1919 as chief engineer and sales manager of the automobile division of the Remy Electric Company. He advanced rapidly in the corporation and recently when Wm. Knudsen, president of the corporation assumed a post to assist the federal government in its preparedness campaign, Mr. Wilson was assigned many of his responsibilities in the corporation.

FOR a long time and particularly during the last few years I have been increasingly interested in the youth problem, if we may call it that, of our present times. We can all think back to when we were 15, 18 or 21, remember what we were doing and hoped to do and realize that times have changed in some important particulars for many boys and young men. When we were boys there seemed to be plenty of work for boys to do. We did not get much money for our work and in some cases it was mostly for our own families, but practically all the boys and young men I knew between the ages of 12 and 21 had some work to do and did it.

I do not seem to remember any talk about boys and young men who wanted to work but were unable to find a job. It was more a question of being able to qualify for a better and higher paying job, or a question of their families being able to keep the boys in school after they were old enough to work.

To help me develop the subject and make clear the points I have in mind I would like to ask all of you some questions: (1) How many of you earned money working other than for your own families before you were 15? (2) How many of you had regular jobs, or if you were going to school worked at least two months at a regular job before you were 18? (3) How many of you were working at a regular job or were going to college when you were 21? (4) How many of you remember any time when you wanted to work, but could not find a job for three months or longer any time between when you were 15 and 24?

Now these experiences do not seem to check with what is going on today. In the May issue of "Fortune" there is an article on youth, principally an analysis of the recent Washington Youth Congress. It carries the headline, "There are 21,000,000 of them between 16 and 24; 4,000,000 lack jobs, prospects, hopes. The result is some apathy, some anger, and a vexed Youth Congress." This article implies that the newspapers of the country, due to the fact that some of the youngsters and some of their connections were at least a little bit pink, really missed the real portent of the congress, the story behind the story, which is one of a generation of bewildered, passive and sold-down-the-river youngsters, 4,000,000 of whom just hang around the cities, towns and villages of the U. S. waiting for an economic system to expand and take them in.

Youth's Viewpoint

Of course only an actual census of the young people of the country would determine to what extent the Youth Congress expresses their point of view. To further quote from the "Fortune" article: "But inasmuch as the Youth Congress is about the nearest thing to a youth movement that we have, we may take it as indicative of a mood. When 5,000 boys and girls in Washington, or at least a vociferous segment among them, booed the President and demanded the passage of an American Youth Act to make $500,000,000 a year available to indigent young people, oldsters at once set them down as an unmannerly bunch whose highest reach of cerebration was to ask for a handout. This probably does the great majority of American youth an injustice. At any rate it is a trifle smug to single out youth for exhibiting a case of the 'gimmies' when the farmers, the tariff lobby, the Workers Alliance, the Townsendites, the big Navy boys and the American Legion all exhibit the same taint. It may be true that youth is hardly original in its proposals for putting the national economy and with it 4,000,000 boys and girls back on the track of progress, but the trends that have produced a vexed younger generation go back a long way beyond the depression of the '30's and if young people are in a bad way then so are their elders, particularly their elders who are responsible for an educational system that provides neither the philosophy nor the vocational skills needed to survive and grow in the contemporary world.

"In the eighteenth century, social thinkers were in the habit of setting up a criterion of the desirable organization of society; they thought in terms of a desirable way of life that would blend personal freedom and personal opportunity, and then worked toward it. But the nineteenth century put its emphasis on vast and impersonal processes. In the beginning this emphasis, which was a manifestation of the new scientific approach, was liberating—for the expanding universe of nineteenth-century capitalism promised to make room for everybody willy-nilly: Adam Smith's invis-

ible hand would conduct everybody to his proper niche in a perfect world division of labor. But, with the coming of the first World War and its fearsome aftermath, the philosophies of liberation were turned into the debased coinage of passivity. The great intellectual names of the nineteenth and early twentieth centuries have become excuses, alibis for not using your mind and will power."

Increase in High School and College Graduates

I have quoted part of this article in Fortune to help outline the problem and give the point of view of the writer of the article on the current situation. Perhaps the young folks do not realize that they have a subsidy in our educational system, in fact the first important subsidy in our political history is that neither they nor their families pay anything like the cost of their education. I have looked up some figures and find that there has been a great increase in high school and college attendance. In the year 1920 there were 311,266 high school and equivalent private school graduates. This has increased through the year until in 1938 the best estimate is 1,075,000 graduates. During this same period from 1920 the number of college graduates increased from 48,622 to 147,500.

Unemployment figures are difficult to obtain, especially for 20 or 30 years ago, as apparently it was not one of our problems at that time and no very good statistics seem to be available. In 1929 the unemployment of all ages has been estimated at 429,000, or nine-tenths of 1 per cent of the labor force, which can be taken roughly as those employed or seeking employment. The National Industrial Conference Board gives these figures for the year 1930:

	Labor Force	Unemployed	Unemployed Per Cent
15-19 years	4,283,000	1,103,353	25.8
20-24 years	7,174,000	1,317,055	18.4
25-44 years	22,393,000	2,970,854	13.3

These figures seem to show very clearly that the young people are taking more than their part of the unemployment that is currently existing. The serious part of this of course is that idleness in youth is all too likely to mean unemployment in manhood and after life, as the necessary habits and discipline of work and the knowledge to handle even simpler work is not acquired at the right age and, therefore, may be never acquired. To help understand the problem I have thought back over some of my own experiences as a boy, which I am sure is not greatly different from yours, to help me realize the changed conditions which exist.

Possibilities of Work Thirty Years Ago

I happened to live in a small town in Ohio. The industries there were very small and, shall we say, somewhat informal, but at the same time they provided a perspective of work and activity which I had even when I did not work at a job for money that is hardly duplicated at the present time. For instance, there was a blacksmith's shop a square down the street and the blacksmith would let you hold the horse while he was shoeing it, pump his bellows, or help him shrink a tire on a wheel if you hung around and showed any interest in what was going on.

Then there was a saw mill and planing mill across the street where a few men worked who were not at all strict about boys being around the place or of explaining to them about their work. The owner of this mill was also a material supplier for the town. Whenever a carload of slate or tile or special grades of lumber which he did not mill himself came in on the siding, some of us would be employed to unload it and for miscellaneous jobs around the place.

A very small power house was built in the village when I was about 12 years old and the first running water and electric light system was installed in the town. Two men operated this small unit, one in the daytime and one at night. These men didn't have a great deal to do and were quite willing to let some of the boys shovel coal under the boilers for them and in turn showed them how to blow off the boilers, throw the power switches, how the arc lamps worked and many other things for those who were interested.

Education by Observation

There was a small coal mine on the edge of town that employed five or six miners and a mule driver. The father of one of my school friends worked in this mine and I remember of first going into the mine with this boy to take his father's dinner bucket into him. Later, on several occasions, I remember helping to load coal cars with coal, somewhat to my mother's disgust because I came home quite dirty, but on the other side I learned how you ventilated the coal mine with a fire door and fire, that you couldn't go into certain entries where the air was bad, that sulphur water rusted the pipes through which they pumped water out of the mines. How coal was mined by undercutting and how it was brought down by powder charges, in those days put off with squibs. Two locomotive engineers were neighbors and particularly the one who had the freight run, when his engine happened to be on a siding in the little town, would let me get up in the cab and he would explain to me as best he could how the locomotive operated. Perhaps I would bring his lunch down to him or take a message back to his wife.

The point I am trying to make is that 30 or 40 years ago industry and working activities were not on such a formal and large scale operation and it was much easier for a boy or a young man to see what men did when they worked, and, even before they were old enough themselves to work, begin to understand how to do things. In the second place before we had such good machinery and equipment and such well organized ways of doing things there were a great many things that boys and young men could do which were really necessary for someone to do, but at the same time it got them started at something worth while. Without the general use of telephones there were messages to be run. There was more water to be carried, as we did not have thermos bottles. There were horses and cows to be taken care of and many

simpler jobs in connection with small businesses which boys could do and could start earning some money for doing.

Conditions Contributing to Present Conditions

On the other side a great deal of emphasis has been placed and properly so on the value of education, but apparently we have overlooked the fact that book learning alone without the knowledge of how or the willingness to do some of the simpler jobs ultimately leaves a boy graduating from high school at 18 or 20, or from college at 21 or 24, with quite a handicap, especially if he has not even associated with people while they were working.

So three things have apparently contributed to the situation which exists today. First, there has been an unemployment problem in the country and I'm not going into any of the reasons for or the economic facts of the situation, but merely wish to state that in the effort to protect the skilled workers and the older employees the young people have been somewhat discriminated against. Second, they have been given a false idea of the economic value of an education, which Fortune aptly says provides them neither with the philosophy nor the vocational skills needed to survive and grow in the contemporary world. Third, our highly organized modern manufacturing methods and ways of doing things do not easily provide a method for boys and young men to start out with small and simple jobs, acquire the habit of working and at the same time a knowledge of what men did when they worked.

What Can Be Done

Now what can we do about the problem? First, it seems to me that we should do all we can to restore the hope and ambition of the young people. After all, the world's work will have to be done and there is no reason why they cannot find a part in it, nor why they do not have opportunities at least as great as existed when we were boys. I think this point of restoring the ambition and morale really comes first.

The General Motors Corporation in an opening party at the World's Fair Monday night of this week made an effort to stress this point. They called the party "Forum of Youth and Industry." About 400 young men from about 80 colleges were there at the corporation's expense to hear the messages from the speakers. The speakers besides Mr. Sloan, Mr. Knudsen and Mr. Kettering of General Motors included Dr. Karl T. Compton, president Massachusetts Institute of Technology; Dr. Ernest M. Hopkins, president of Dartmouth College, and General Hugh S. Johnson.

Second, I think we should all take more interest in our schools and, where we are so situated, in our colleges, to see if we cannot help the educators work out a more practical course that better fits the requirements of our times.

Third, those of you who employ other people or influence their employment should make a special effort to have work for boys. Where possible work by some form of apprentice, cooperative work with educational institutions. In other words, our modern industry, in fact our modern society, has become so specialized and in a certain sense complicated that we must organize the problem of employment of young people just like we have organized a great many other things.

A letter received by Mr. R. H. Grant, vice president of General Motors in charge of sales activities, is an indication that this problem is being realized in some quarters. From my point of view the letter is quite encouraging and I am going to read it to you:

"Dear Mr. Grant:

"On November 15, 1939, there was launched in the state of Pennsylvania a job mobilization program in which labor, industry and the state government joined together in a mutual nonpartisan effort to help solve the unemployment and relief problem existing in this commonwealth.

"Mr. Walter D. Fuller, president of the Curtis Publishing Company, was appointed as chairman of the job mobilization committee, and Mr. William A. Hemphill, from the firm of Day & Zimmerman, Inc., of Philadelphia, was appointed the executive director to carry out the program, a copy of which is attached hereto.

"In the course of our investigation of unemployment, we have found a great shortage of skilled mechanics existing in this state. This condition to a large extent is due to there having been no apprentice schools or apprenticeships provided by industry during the past ten years. I am sure that you are well aware of this condition, but we are wondering whether you have given serious consideration in providing some method of schooling for apprentice mechanics. We have learned authoritatively that there will be an additional lack of automobile mechanics this coming year due to better business conditions.

"So far as we have been able to learn the various automobile dealers have not given serious thought to this apprenticeship problem which they are facing. We are, therefore, addressing this letter to you with the suggestion that through your cooperation you advise your various dealers of the necessity of establishing apprentice mechanics in their garages and shops in the state of Pennsylvania.

"In the state of Pennsylvania, the law governing maximum hours for workmen was declared unconstitutional, and there is no minimum wage for men. The federal Wage and Hour law requires a minimum wage of 30 cents per hour, and up to the present time there has been no court decision or any interpretation which would place a retailer of automobiles, doing more 50 per cent of his business in this state, under this act. It would appear, therefore, that dealers could employ apprentices at reasonable figures, and even though they did comply with the 30-cent minimum an hour wage under the federal law, and worked their mechanics forty-two (42) hours a week, the salary would amount to but $12.60 a week. In view of this very definite shortage of automobile mechanics existing, is it not to your advantage to do something

NOW towards developing apprentice workmen as part of the service which you expect to render to the public?

"If you can properly insist upon such a program among your dealers, work will be provided for many young men who are now unemployed, and many of whom are now on relief.

"Relief and unemployment and taxes are the Siamese Twins in this state. If unemployment can be decreased, and the relief load decreased, taxes will consequently be lowered.

"We would appreciate very much your investigating this matter, and, if possible, have your cooperation at an early date. Will you kindly advise us regarding this?"

Yours very truly,

(Signed) William A. Hemphill,

Executive Director, Commonwealth of Pennsylvania Job Mobilization Committee.

Summarizing

To sum up these points:

(1) Do what we can to restore hope, ambition and confidence in the boys and young of the country, so that they will feel there is a place for them in the work of the country.

(2) Do what we can in cooperating with our educational institutions, even in some cases, helping work our cooperative arrangements with industry, so that graduates will be in a better position to get jobs.

(3) Where we have activities under our supervision definitely plan work for boys and young men and plan to employ our proportionate share of young people at proper wages for work they can do.

National Apprentice Contest

FIRST started at the Milwaukee Convention in 1925, the apprentice molding and patternmaking contests have each year developed keener competition. Certainly the judges of the four divisions this year will agree to that. The standard of workmanship that has been established by the numerous participating apprentices from all over the country has been extremely high. This improvement in the craftsmanship of the apprentices was acclaimed time and time again by the hundreds of foundrymen who filled the Apprentice Training booth day after day during the convention and inspected and handled the numerous castings and patterns displayed by these boys.

The castings and patterns displayed in this booth made it possible for plant executives to view work done by apprentices and to see what could be accomplished by means of a good apprenticeship policy. It was an aid to illustrate to many interested men in deciding that apprenticeship was not just giving a job to a boy to get him off of the streets; but it showed to him that with sufficient training he could become a benefit to his shop, community, employer and family.

The Apprentice Training Committee should be proud of the record that they have set for the Association, as they inspired the thought of apprentice competition in over eighty foundries and pattern shops. Many chapters of the Association, such as Northeastern Ohio, Wisconsin, Detroit, St. Louis and Quad City, took an active part and carried on local contests and submitted entries along with many individual companies. The cooperation received from the various organizations is truly an incentive for the Association to carry these contests on for a long time to come.

Fredric Edstrom (left) and Harold Downey, International Harvester Co., Rock Island, Ill., second and third prize winners, respectively, gray iron molding contest.

Emmett Klessig
Wisconsin Aluminum Foundry Co.
First Prize Non-Ferrous

The pictures of nine winners are shown on this page. The three winners from Milwaukee are shown in the group of apprentices at the Wisconsin chapter meeting, page 13.

Thomas F. Murphy
Brown & Sharpe Mfg. Co.
First Prize Gray Iron

John L. Mahon
H. & B. American Machine Co.
First Prize Pattern-making

Melvin Amole
Birdsboro Steel Fdry. & Mach. Co.
First Prize Steel

Robert Darmour
Crucible Steel Castings Co.
Second Prize Steel

Joe Birkenheur
Crucible Steel Castings Co.
Third Prize Steel

Alan Miller
American Steel Foundries
Third Prize Pattern-making

New Cupola Research Project Organized

ONE of the most important cooperative research projects ever organized by the Association is that on cupola research, initiated this past year by the Gray Iron Division, a project comparable in scope and importance to the sand research work of the Association begun in 1921. The Gray Iron Division has, this past year, completed the organization of a committee to survey the published and known data on cupola practice. Following the publication of such a survey, which will be an authoritative review of the best existing methods, the program will cover research to give further information which the survey will undoubtedly show as lacking at the present time.

"What is the best method to operate a cupola?" is one of the surest topics to bring out many differences in personal opinions and practices. Probably no subject has been more widely discussed without reaching generally accepted conclusions. While a vast amount of research work and practical experimentation has been conducted and numerous papers written, it has appeared to the Gray Iron Division Advisory Committee that the survey mentioned above was most needed to sift the worthless from the worthwhile data. Approval to proceed with the project was received from the Board of Directors of the Association and the Division then set about making plans to organize this activity in such a way as to carry it to a satisfactory conclusion which should result first in the publication of a book on the best recognized methods of cupola operation and related information.

Realizing the greatness of the task, due to the extreme number of unknown variables, the Division, in organizing the committee, has sought the services of a large number of outstanding cupola authorities and others who are authorities along the related lines of work. A. L. Boegehold, Head, Metallurgical Department, Research Division, General Motors Corp., has been selected to head the project as general chairman. The members of the committee have been divided into sub-groups under the following headings: (1) Equipment, (2) Ferrous Materials and Alloys (a) Pig Iron, (b) Scrap, and (c) Alloys, (3) Slags, Fluxes and Desulphurizers, (4) Fuels and Combustion, (5) Operation and Process, and (6) Refractories. The successful completion of the project, which is based on a five-year program, is assured by the high standing and abilities of those who have consented to serve on the committee as given below:

Personnel of Cupola Research Committee

Executive Committee—

Chairman, A. L. Boegehold, Metallurgy Dept., General Motors Research Laboratories Div., General Motors Corp., Detroit, Mich.

H. Bornstein, Deere & Co., Moline, Ill.

H. Kenneth Briggs, 4000 W. Washington Blvd., Chicago, Ill.

A. E. Caudle, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

V. A. Crosby, Climax Molybdenum Co., Detroit, Mich.

G. S. Evans, Mathieson Alkali Works, New York City.

A. W. Gregg, Whiting Corp., Harvey, Ill.

L. C. Hewitt, Laclede-Christy Clay Products Co., St. Louis, Mo.

T. G. Johnston, Republic Steel Corp., Republic Bldg., Cleveland, O.

J. A. Kayser, Laclede-Christy Clay Products Co., St. Louis, Mo.

Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.

John Lowe, Vilter Mfg. Co., Milwaukee, Wis.

J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.

S. C. Massari, Association of Manufacturers of Chilled Car Wheels, Chicago, Ill.

R. G. McElwee, Vanadium Corp. of America, Detroit, Mich.

W. O. McMahon, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.

R. S. Moore, Harbison-Walker Refractories Co., Pittsburgh, Pa.

B. P. Mulcahy, Citizens' Gas & Coke Utility, Indianapolis, Ind.

B. C. O'Brien, Roots-Connersville Blower Co., Connersville, Ind.

G. P. Phillips, International Harvester Co., Chicago, Ill.

C. S. Reed, Jr., Chicago Retort & Fire Brick Co., Chicago, Ill.

D. B. Reeder, Electro Metallurgical Co., Chicago, Ill.

E. K. Smith, Electro Metallurgical Co., Detroit, Mich.

F. J. Walls, International Nickel Co., Detroit, Mich.

*H. S. Washburn, Plainville Casting Co., Plainville, Conn.

*L. N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala. (President A.F.A.)

*H. S. Simpson, National Engineering Co., Chicago, Ill. (Vice President A.F.A.)

(1) Subcommittee on Equipment—

(Chairman) A. W. Gregg.

M. J. Bradley, Leeds & Northrup Co., Philadelphia, Pa.

---

*Ex-officio.

A. E. Caudle, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
W. A. Hambley, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
W. R. Jennings, John Deere Tractor Co., Waterloo, Ia.
W. C. Juram, Bristol Co., Waterbury, Conn.
John Lowe, Vilter Mfg. Co., Milwaukee, Wis.
J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.
B. A. Miller, Cramp Brass & Iron Foundries Co., Philadelphia, Pa.
B. C. O'Brien, Roots-Connersville Blower Co., Connersville, Ind.
W. Lee Roueche, McWane Cast Iron Pipe Co., Birmingham, Ala.
L. C. Smith, Spencer Turbine Co., Hartford, Conn.
P. T. Sprague, Hays Corp., Michigan City, Ind.

(2) Subcommittee on Ferrous Materials and Alloys—
(Chairman) R. G. McElwee.

(a) Sub-subcommittee on Pig Iron—
(Chairman) T. G. Johnston.
B. H. Booth, Jackson Iron & Steel Co., Jackson, Ohio.
Fred Carl, Delco-Remy Div., General Motors Corp., Anderson, Ind.
A. H. Dierker, Representing Globe Iron Co., Jackson, O.
R. A. Donaldson, Woodward Iron Co., Woodward, Ala.
H. W. Johnson, Inland Steel Co., East Chicago, Ind.
T. L. Joseph, University of Minnesota, Minneapolis, Minn.
M. J. Lefler, Western Foundry Co., Chicago, Ill.
R. A. Lindgren, Wisconsin Steel Works, South Chicago, Ill.
W. O. McMahon, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.
J. E. Reynolds, U. S. Pipe & Foundry Co., Bessemer, Ala.
W. G. Reichert, American Brake Shoe & Foundry Co., Mahwah, N. J.
H. M. Rich, Hickman Williams & Co., Detroit, Mich.

(b) Sub-subcommittee on Scrap—
(Chairman) Max Kuniansky.
H. Bornstein, Deere & Co., Moline, Ill.
D. Meloche, Institute of Thermal Research, Yonkers, N. Y.
L. W. Pryse, Hickman Williams & Co., Cincinnati, O. (Representing Institute of Scrap Iron-Steel)
W. G. Reichert, American Brake Shoe & Foundry Co., Mahwah, N. J.
E. K. Smith, Electro Metallurgical Co., Detroit, Mich.
H. W. Stuart, U. S. Pipe & Foundry Co., Burlington, N. J.

(c) Sub-subcommittee on Alloys—
(Chairman) R. G. McElwee.
T. E. Barlow, Vanadium Corp. of America, Detroit, Mich.
G. F. Comstock, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
V. A. Crosby, Climax Molybdenum Co., Detroit, Mich.
V. H. Schnee, Battelle Memorial Institute, Columbus, O.
E. K. Smith, Electro Metallurgical Co., Detroit, Mich.
F. J. Walls, International Nickel Co., Detroit, Mich.

(3) Subcommittee on Slags, Fluxes and Delsulphurizers—
(Chairman) G. S. Evans.
Wayne Cockrell, Michigan State College, East Lansing, Mich.
A. W. Demmler, Vanadium Corp. of America, Bridgeville, Pa.
A. H. Dierker, Ohio State University, Columbus, O.
H. H. Judson, Goulds Pumps, Inc., Seneca Falls, N. Y.
M. J. Lefler, Western Foundry Co., Chicago, Ill.
C. H. Lorig, Battelle Memorial Institute, Columbus, O.
J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.
L. H. Rudesill, Griffin Wheel Co., Chicago, Ill.
R. Schneidewind, University of Michigan, Ann Arbor, Mich.
F. W. Scott, University of Minnesota, Minneapolis, Minn.

(4) Subcommittee on Fuels and Combustion—
(Chairman) S. C. Massari.
Gordon Creusere (Semet-Solvay Co.), 17362 Washburn Ave., Detroit, Mich.
J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.
M. F. Milligan, Lunkenheimer Co., Cincinnati, Ohio.
B. P. Mulcahy, Citizens' Gas & Coke Utility, Indianapolis, Ind.
R. A. Sherman, Battelle Memorial Institute, Columbus, O.
T. J. Wood, American Brake Shoe & Foundry Co., Mahwah, N. J.

(5) Subcommittee on Operation and Process—
(Chairman) G. P. Phillips.
H. Kenneth Briggs, Miller & Co., Chicago, Ill.
John Grennan, University of Michigan, Ann Arbor, Mich.
W. A. Hambley, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fulton Holtby, University of Minnesota, Minneapolis, Minn.
C. F. Joseph, Saginaw Malleable Iron Div., Saginaw, Mich.
J. J. Kanter, Crane Co., Chicago, Ill.
M. J. Lefler, Western Foundry Co., Chicago, Ill.

(Continued on page 22)

Research and Developments in Cast Metals†

C. H. Lorig,* Columbus, O.

†This is the second section of the address Mr. Lorig, supervising metallurgist, Battelle Memorial Institute, Columbus, Ohio, presented before the Cincinnati District Chapter, American Foundrymen's Association, February 13, 1940. The first part of the author's paper dealt with developments in cast iron and was printed in the June issue of American Foundryman.

Developments in Cast Steel

THE technical and industrial developments leading up to the present status of the low alloy, high yield strength, structural steels have had a profound effect in the steel castings industry as well. Low alloy, high strength cast steels have been developed in the past few years to provide for a combination of properties of castings in the normalized state to meet the following specifications of the A.A.R.: Tensile, 90,000 lb. per sq. in minimum, yield 60,000 lb. per sq. in. minimum, elongation 22 per cent minimum, and reduction of area 45 per cent minimum. The trend in design for railroad equipment is towards lightening the weight of existing structures without any sacrifice of strength.

Some Railroad Alloy Steels

The three steels so far accepted by the railroads are nickel-manganese, the manganese-vanadium, and the manganese-titanium types. Each contains from about 1.25 to 1.70 per cent manganese. The average amounts of nickel, vanadium, and titanium added are 1.00-1.50 per cent Ni, 0.10 per cent V, and 0.05 per cent Ti. These steels in the normalized condition and suitably drawn have the same properties so that the choice between them depends on the practice and experiences of the individual foundries. Considerable tonnages of side frame, bolster, coupler, and other castings have been put to test on railroads. Substantial savings in weight have been effected.

These new steels and the lightening of the structures have introduced many problems in design and casting technique. The reduction in section has greatly increased the importance of casting defects and has placed a premium on more perfect castings. Some of the difficulties are successfully being overcome by better supervision of melting, pouring, molding, and sand technique; yet there is still much to be done towards perfecting the surface and eliminating the so-called stress raisers in the castings.

Airplane Landing Gear

Finlayson[2] of the Pacific Car and Foundry Company recently described the use of steel castings in landing gear assemblies in the construction of giant transports of the most modern design. Here was an application for steel castings that required a careful scrutiny in the art of casting before the castings could be made successfully. The chemical and physical requirements for the steel in the castings were not difficult to satisfy. However, any form of crack or shrink or discontinuity on the surface or within the castings caused them to be rejected. They were finally made of copper-silicon steel containing 0.12 to 0.20 per cent C, 1.10 to 1.35 per cent Mn, 1.0 to 1.25 per cent Si, 1.50 to 2.0 per cent Cu. This alloy steel was said to have marked fluidity so that it was capable of running into thin sections without cold shuts. Dry sand molds were used exclusively in the production of the castings, special precautions being taken to secure adequate venting and core relief. The molds were coated with a double wash of zirconium oxide which notably improved the surface.

The castings are subjected to the most thorough inspection at the foundry and again at the customer's plant when received. The customer examines them for cracks and other defects by magnafluxing when received. After each part is machined it is pickled and cadmium plated, operations which innocently serve to reveal slag spots, spongy areas, and internal fissures exposed on machining. If no defects are discovered by this means the castings are again magnafluxed. After this, some castings are X-rayed to discover internal cavities or shrinks. The number of accepted castings naturally falls far below the average commercial yield. That castings are being made for and are accepted by the aircraft industry is an indication of the marked refinements that are possible in casting technique. This development should be an inspiration to the steel casting industry since it paves the way to new applications for castings that formerly were outside their accepted sphere.

Steel Castings and Forgings

It should be remembered that castings have engineering values in their own right. In many uses of steel castings, as for instance where flow lines lead to failure, the lack of directional properties in the castings made them more enduring than forgings.

Centrifugal Cast Gears: A year ago Ford Motor Company first announced the successful casting of steel gear blanks in centrifugal dies. The method is now in regular production of all Ford truck ring gear blanks and will be extended to full production of car ring gears and transmission cluster gears as quickly as the necessary equipment is completed. The advantages claimed for the gears made by the new method are greater strength, lighter weight, and faster production. The improved strength in the cut teeth, for example, is the direct result of the absence of all flow lines in the centrifugal castings. Thus the metal is equally strong in all directions and is not weakened by flow lines parallel to lines of greatest stress, a condition which exists in some forgings.

It is now being recognized that steel castings have an advantage over forgings on another score. The coarse grain structure of the casting seems to give it inherently greater resistance to gradual distortion at high temperature, i.e., greater creep strength than forged material of the same composition. Work which Battelle and others have done on creep testing of such materials has indicated this superiority for the cast steels.

Low Ductility Causes Discovered

The factors which lead to low ductility in cast steel are finally being discovered. The work of Sims and Lilliquist done at American Steel Foundries, the more recent work by Sims and Dahle at Battelle and the contributions of several other investigators have clarified the situation enormously. Low ductility is invariably associated with certain arrangements of non-metallics, especially manganese sulphide.

As a result of their work, Sims and coworkers reasoned that materials which may later form inclusions are in solution in liquid steel. A high oxygen content decreases the solvent power for these non-metallics and hence in the presence of high oxygen they precipitate out of solution in the early stages of solidification and

[2]Iron Age, Vol. 144, July 20, 1939, pages 43-47.

take the globular, harmless form. The solvent power of the steel for non-metallics increases as the liquid metal is more thoroughly deoxidized; under these conditions the non-metallics are held in solution till near the end of solidification and are then precipitated in the harmful network or eutectic form.

Sims and Dahle[3] found that with no aluminum the manganese sulphide inclusions are globular and not harmful. With small amounts of aluminum, sulphides are precipitated in a string-like or eutectic form giving rise to a network in the steel and to low ductility. By using larger amounts of aluminum the aluminum sulphide type of inclusion is formed which again is less soluble in the steel and hence precipitates as harmless inclusions. Their results on the effect of aluminum on the ductility and impact strength of grade "B" steel of different sulphur contents are summarized in Fig. 7.

Recently Crafts[4] of Union Carbide and Carbon Laboratories has indicated that the ductility may be further augmented by the introduction of calcium with the aluminum.

"Spots" in Cast Steel

The occurrence of "spots," called fish-eyes in welds, in fractures of test bars of cast steels is now receiving rather general consideration. These "spots" are attributed to hydrogen. They may appear, for example, when the steel is tested shortly after normalizing. Long aging at room temperature or short aging at a moderately elevated temperature causes the spots to disappear and with their disappearance the ductility of the steel is profoundly improved. It seems that "spots" do not occur, for some unknown reason, in steels from every heat. So far as is known they have never caused a service failure; yet they may be responsible for many instances where test specimens fail to meet specifications for ductility. The same problem is being faced by the welding industry and to a lesser extent by the steel industry in general. As an expedient, low temperature annealing is quite effective in removing "spots." A serious effort is now being made to study the factors involved in "spot" formation so as to minimize or prevent their occurrence.

Alloying and Heat Treatment

In the last year or two mixtures have been developed for introducing various alloying elements into cast steel and iron that produce heat and cause the various alloys to melt immediately and disseminate in the metal without a decrease in temperature. This has made possible the extensive alloying of steels and irons in the ladle, and the introduction of alloys to the furnace without chilling the bath. The Chromium Mining and Smelting Company have conducted work at Battelle on this development for several years and are now actively engaged in commercializing the development by supplying the steel and castings industry with various alloying materials contained in a heat producing mixture. Their various so-called "Chrom-X" mixtures are being employed in a number of foundries in the United States and Canada.

More emphasis has been given lately to the heat-treating of steel castings with the result that castings even as large as 1½ tons are being water-quenched and tempered. The water quenching of castings is not new; yet the steel foundry has been very slow in realizing its possibilities.

High Temperature Effect on Sands

One might mention the progress made on investigating the effect of high temperatures on steel sands being done at Cornell University under the sponsorship of the American Foundrymen's Association. This work has shown that some sand mixtures are sensitive to heat-shock whereas others are not. Information gained from such tests should eventually be of direct interest to the steel castings industry in assisting to better the methods of compounding sand mixtures to meet the actual conditions that develop in the casting of molten metal.

Developments in Malleable Iron

The malleable industry, as a whole, made little change in its product in the past quarter century. It is true that the general level of strength and ductility has been raised from time to time, but this was done mainly by lowering the carbon content without further altering the composition

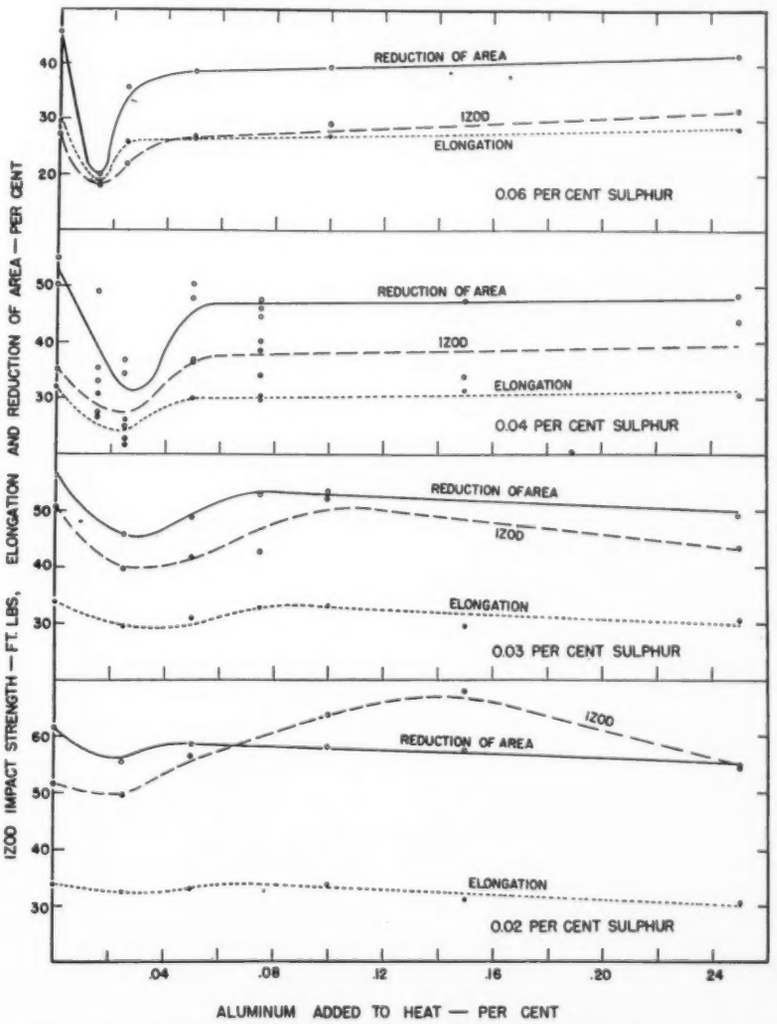


Fig. 7—The Effect of Aluminum on Ductility and Impact Strength of Grade "B" Cast Steels.

[3]Transactions, American Foundrymen's Association, Vol. 46, 1938, pages 65-132.

[4]Crafts, W., Egan, J. J., and Forging, W. D., *Formation of Inclusions in Steel Castings*, Metals Technology, A.I.M.E., April 1940.

or the annealing practice. The only thing that might be done to change the properties of the fully malleablized iron is to alloy it, and this is done to a limited extent in a few plants.

Quick Anneal

A few foundries are producing short-cycle malleable, the quick anneal being accomplished by taking advantage of the accelerating effect of higher silicon and by using higher annealing temperatures. This calls for very careful supervision of the melting operation, a close check on raw materials, and vastly better annealing furnaces than the old box-type, batch furnaces in order to reap the full benefit from the possible reduction in annealing time. These quick annealing irons have 2.0 to 2.20 per cent carbon and 1.50 to 1.60 per cent silicon, the manganese, sulphur, and phosphorus being the same as in normal malleable. They can be fully malleablized in less than 24 hours in continuous furnaces with temperatures close to 1800°F. in the first stage of malleablization.

Pearlitic Malleable

Various so-called pearlitic malleable irons are being marketed ranging in tensile strength from 60,000 to 120,000 lb. per sq. in. These irons are being produced on a relatively small scale as yet, though it is possible their use will continue to increase as it has in the past. New combinations of properties are to be found in these irons.

There has been much interest in the low carbon irons, or steels, as they are often called, of the Ford crankshaft type, which, in a sense, belong to the malleable class. These are highly alloyed and are given a short heat-treatment to graphitize part of the carbon and to impart some ductility. We can look forward to increased use of such irons not only to supplement the usual and pearlitic malleables but also to develop new fields for the use of castings.

Developments in Non-Ferrous Castings

From an alloy standpoint, the development of various types of silicon bronzes has been of major importance in the past few years. Several of them have made considerable progress in the last year in the engineering field, notably those of the Everdur type and P.M.G. metal. The latter also contains, besides 1.2 to 3.2 per cent silicon, 0.5 to 1.2 per cent iron. Some silicon bronzes have been modified in composition to permit heat-treatment.

Silicon Effects

Silicon has a marked effect on increasing the fluidity of bronzes. While silicon bronzes have had a rather bad reputation with the foundrymen, owing to their tendency towards gas porosity some of the modified silicon bronzes seem less susceptible to this difficulty. One silicon alloy developed at Battelle is of the latter type. It has 83 per cent copper, 5 per cent silicon, 10 per cent zinc, 1 per cent manganese and 1 per cent aluminum, and has a tensile strength of 88 to 92,000 lb. per sq. in., a yield of 46 to 60,000 lb. per sq. in., and an elongation of 1 to 4 per cent.

Hydrogen and Unsoundness

In working with this alloy it was found that the most practical means to eliminate the absorbed hydrogen and make sound castings has been to overheat the melt temporarily, to about 2000°F., whereby zinc vapor sweeps out most of the gas. After about one minute of this treatment the melt is quickly cooled to the pouring temperature of about 1650°F. and cast. This alloy is susceptible to precipitation hardening. In this treatment it is quenched from 1425-1470°F. and subsequently heated to 575°F. at which temperature it precipitation hardens very rapidly, giving a maximum hardness in only about 15 minutes.

Copper-Silicon-Zinc

In studies at Battelle on the question of unsoundness of the copper-silicon-zinc brasses melted in various gases, it was found that hydrogen caused marked unsoundness regardless of the crucible material or the dryness of the hydrogen. While the results on steam were inconclusive, it appeared as if steam had little to do with unsoundness. We were unable to attribute unsoundness to carbon monoxide. Superheating of this alloy caused the zinc vapors from the alloy to sweep out most of the gas.

Modified Alloys

One of the outstanding alloy developments in copper alloy production has been the use of antimony, arsenic, or phosphorus to prevent dezincification in admiralty and other condenser tube alloys subject to such attack. While the trend in wrought copper production is strongly toward these modified alloys it is doubtful that the non-ferrous casting industry has as yet utilized antimony, arsenic, or phosphorus to prevent dezincification in copper-zinc castings subject to such attack. The amount of antimony or arsenic used is of the order of 0.1 to 0.2 per cent.

Heat Treatment

Heat treatment of non-ferrous alloys is becoming more and more common. The modification of some silicon bronzes and brasses to permit heat treatment has already been mentioned. Beryllium bronze always depends upon heat treatment for its best results, and aluminum bronzes, which have been heat treated for some time, are now being used in heat treated form to a much larger extent. The copper-chromium alloys now being employed for copper engine heads and for many other purposes are often in the precipitation hardened state.

Manganese Base Alloy

In reviewing electrolytic manganese and its alloys, Dean[5] states that alloys containing 65 to 70 per cent zinc, 20 per cent manganese and the balance copper, give excellent high strength castings and should be attractive on account of their cheapness. A manganese base alloy with 80 to 85 per cent manganese and 15 to 20 per cent copper on quenching from a solution temperature has a low hardness of 50 Brinell. In a subsequent precipitation hardening treatment it reaches a hardness of 500 Brinell.

A very rapid growth has taken place in the production of magnesium castings. Since 1934 the production has increased several fold. The magnesium alloys are also strengthened and made more ductile by heat treatment, a practice which is commonly resorted to.

Powdered Metal Articles

Powder metallurgy is slowly challenging the casting industry in the production of many articles. Investigations are being conducted in the possibilities of substituting the processes used in powder metallurgy for the production of articles now made by the standard practices of melting, casting, and fabricating. In some cases it is a mere matter of substitution while in others the powdered metal articles are supreme.

Powder metallurgy is proving useful in some phases of bearing manufacture. Oil-less bushings with uniform porosity are being used widespread. Soon a new type of copper-lead bearing made by powder metallurgy processes from chemically pure constituents and uniformly distributed throughout the alloy will be available. This bearing will doubtlessly challenge the present position of the cast, copper-lead bearings and may eventually supplant the latter.

[5]Metal Progress, Vol. 36, 1939, pages 357-358.

Some good is bound to come to the casting industry as a result of this intensive study now being given to powder metallurgy processes. Leach points out[6] that it is possible the study of powder metallurgy will give physical metallurgists a better opportunity to observe phenomena that affect the melting, casting, and fabrication of metals and alloys with the reasonable expectation that valuable information may be obtained leading to improvements in standard metallurgical practices.

In conclusion the casting industry has conducted endless experimentation of a practical nature. There has been, however, an almost complete absence of fundamental research. The production of good castings represents, as Melmoth stated[7], a combination of practical and theoretical factors involving great difficulty in their elucidation and understanding. As our attitude toward scientific development becomes more sympathetic and we begin to apply science more generally we can expect a proportionate upturn in progress in the castings industries.

[6]Metal Progress, Vol. 36, 1939, page 350-351.

[7]Foundry, Vol. 48, July and August 1939.

Apprentice Training Fostered by Southern California Chapter

By G. W. Merrefield*, Los Angeles, Calif.

THE Southern California Chapter has co-operated with the Los Angeles public schools in the past year, in conducting classes in foundry technology. Night classes were conducted twice weekly at Manual Arts High School under the tutelage of C. B. Callomon, Warman Steel Casting Co. The school staff co-operated fully with the chapter committee in offering full facilities in the way of classrooms, shops, and paid instructors.

Chapter Course Subject

The course of instruction was chosen by the chapter apprentice training committee, and covered such subjects as elementary chemistry; elementary physics; foundry mechanics; foundry materials; heading and gating; pattern design and construction; elementary metallurgy, including a study of the carbon iron diagram and a study of the effects of alloying elements in steel and iron; an elementary study of steel making; a thorough discussion of the common difficulties encountered in castings; a talk on the casting of stainless and heat resisting steels and an elementary discussion of sand problems.

The maximum number attending the course at any one session was sixty-four, with an average attendance of around forty. Fully one-third of those attending the classes came from the shops and offices of allied industries in the territory, the balance being from the steel and iron foundries.

The training of apprentices is being undertaken by the individual companies, with the classes offered by the schools as auxiliary training. Two to four hours shop work per week in the school foundries was not thought sufficient to train mechanics for the industry.

Foundry Training in Many Schools

Vocational training in foundry work is receiving a great deal of attention in Southern California schools, and many of the major cities in this territory are offering excellent courses in foundry practice. Such courses are now offered in three Los Angeles schools, and in Fullerton High School. Foundry instructors Frank Britt at Manual Arts High School and W. L. Todd of Fullerton High School, are doing an excellent job of preparing young men for work in the foundry industry, as are others in the Los Angeles vicinity. Pasadena High School will probably be added to the roll of those offering vocational training in foundry work next fall, having requested an appropriation for the necessary facilities.

The State Employment Department has co-operated with the foundry industry in its coast wide radio programs on vocational training, and C. B. Tibbetts, president, Los Angeles Steel Casting Co., was the speaker on a program devoted to opportunities in the foundry trades.

Placing Boys in Shops

The foundry industry in Southern California is trying to co-operate with the schools to the extent of finding places in the industry for the young men who show aptitude for foundry work in the vocational schools. Plant visits to the principal foundries of the territory has been part of the work in most of the vocational schools, enabling the young men in the courses to get an idea of the work in commercial foundries.

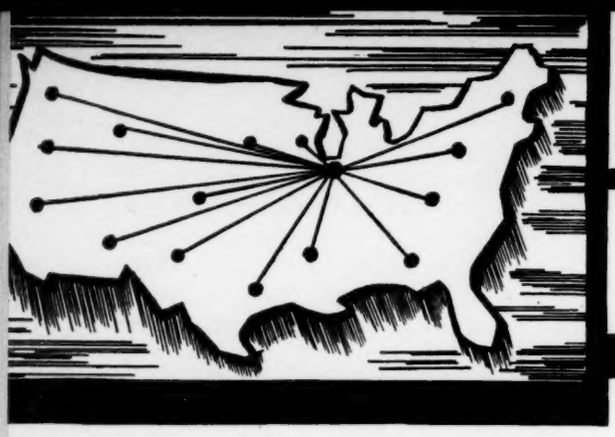
The committee that handled this work for the Southern California Chapter, as appointed by Chapter Chairman A. G. Zima, consisted of C. R. Gregg, Reliance Regulator Co.; Pasquale Arpea, Axelson Manufacturing Co.; J. G. Eberhart, Kay Brunner Steel Products, Inc.; and G. W. Merrefield, Warman Steel Casting Co.

Editor's Note: This pleasing development by the Southern California Chapter, in adopting such a splendid attitude toward an apprentice training program, is quite outstanding. Steps taken whereby elementary foundry information can be given to future foundrymen has been long-coming and this new program is something that can be pointed to with pride by the Chapter and the Association. It is hoped that, through the success of this Chapter's program, others will take up the problem as enthusiastically as did the Southern California Chapter.

*Warman Steel Casting Co. and chairman, Southern California Chapter Committee on Apprentice Training.

Cast Metals Handbook

Attention of members is called to the fact that some have not ordered their copy of the 1940 edition of the Cast Metals Handbook. To enable the office of the Association to complete its records, it is requested that members desiring a copy who have not already received one order it at once, addressing the Association, 222 West Adams Street, Chicago.



Chapter Activities

Foundry Training Discussed at Quad City

By J. Morgan Johnson*, Moline, Ill.

THE necessity of training in the foundry was explained by Roy Wendland to the members of the Quad City Chapter at their May 20th meeting held at the Fort Armstrong Hotel, Rock Island, Ill. Chairman Herman Alex, Rock Island Arsenal, Rock Island, Ill., presided during the meeting.

Mr. Wendland spoke on "Training in the Foundry," giving its history in industry and the importance of quality, profit and self perpetuation. Self perpetuation being the point that is of importance when considering the training of one's self for the foundry industry. Due to the great mass of people employed in manufacturing, the necessity of suitable personnel for supervision and skilled workmanship makes it mandatory to train men into positions in the industry.

The trial training period gives the young man an opportunity to look over the industry and adjust his mind to the form of trade or craft he would find most interesting and beneficial to himself. This is of vital importance as it acquaints him with his coming life's work. He is then told what will be expected of him in his line of work. He familiarizes himself with both company and labor policies. He circulates among the men he is to work with and forms many life time friendships. All these are elementary but very important steps in his training.

Practical work and knowledge are of as great importance as personal development in dealing with problems of fellow workers.

The training programs that are established in the foundry industry, and others, are not only for personal gain, but have shown to give widespread service and an education to those entering and working in the field of industry.

Presentation of local prizes in the Quad City apprentice contest was made by J. H. Ploehn, chairman Tri-City Manufacturer's Association Educational Committee. He also presented prizes to Frederic Edstrom and Harold Downey, both of International Harvester Co., Rock Island, Ill., for receiving second and third place prizes, respectively, in the national gray iron molding contest held during the convention.

The nominating committee announced the following officers and directors elected for the coming year: *chairman,* Nathan Lesser, Deere & Co., Moline; *vice chairman,* A. H. Putnam, A. H. Putnam Co., Rock Island, Ill.; *secretary-treasurer,* J. Morgan Johnson, Tri-City Manufacturer's Association, Moline, Ill.; *directors,* Hyman Bornstein, Deere & Co., Moline, Ill.; Frank W. Wells, J. I. Case Co., Rock Island, Ill.; F. O. Gorman, John Deere Spreader Works, East Moline, Ill.; P. T. Bancroft, Republic Coal & Coke Co., Moline, Ill.; E. C. Wussow, Williams & White Co., Moline, Ill.; J. H. Ploehn, French & Hecht, Inc., Davenport, Iowa; A. E. Hageboeck, Frank Foundries Corp., Moline, Ill.; L. E. Roby, Jr., Peoria Malleable Castings, Peoria, Ill.; and Roy Wendland, International Harvester Co., Rock Island, Ill.

*Tri-City Manufacturer's Ass'n and secretary-treasurer, Quad City Chapter.

Forbes Talks on Profits at St. Louis

By J. W. Kelin*, St. Louis, Mo.

COMPLETING one of its best years, the St. Louis District Chapter held its annual or final meeting of the year on May 23 at the York Hotel. Chapter Chairman L. E. Everett in opening the meeting introduced C. E. Hoyt, A.F.A. executive vice president from Chicago, who gave a brief talk on Association work, congratulating the chapter on its year's activities. C. R. Culling, Carondelet Foundry Co., presented prizes given by the chapter to nine boys for their patterns and castings judged the best in the local apprentice competition. The winners were: *gray iron molding,* A. Blumenberg, L. Clause and R. Blumenberg, all of the Carondelet Foundry Co.; *steel molding,* R. Mueller and Bernard Teiker of the St. Louis Steel Castings Co., and James Dimos, American Manganese Steel Co.; *patternmaking,* R. Twillmann, National Art Bronze Co., E. Elstermeyer, Arneson Pattern Co., and G. Judkins, National Art Bronze Co.

Annual reports of officers and committees were presented and officers elected were *chairman,* W. Carter Bliss, Scullin Steel Co.; *vice chairman,* L. J. Desparois, Pickands Mather & Co.; *secretary-treasurer,* J. W. Kelin, Federated Metals Div., A. S. & R. Co.; *directors,* L. E. Everett, Key Co.; Walter Zeis, Midwest Foundry & Supply Co.; C. B.

*Federated Metals Div., A. S. & R. Co. and secretary-treasurer, St. Louis District Chapter.

Shanley, Semi-Steel Castings Co., and Geo. W. Mitsch, American Car & Foundry Co.

The technical speaker of the evening was Duncan P. Forbes, president, Gunite Foundries Corp., Rockford, Ill. Mr. Forbes talked on "Cost Plus Profit Equals Price." This talk was very enlightening as to what foundry management should consider in its selling prices. Many of the traditional methods of setting prices were shown to be misleading and productive of losses to the foundry. This talk was one of the best presented to the chapter this year and was as interesting to the shop man as to the executive.

Wisconsin Honors Old and New Timers

By A. C. Ziebell*, Oshkosh, Wis.

THE annual meeting of the Wisconsin Chapter held May 17 at the Schroeder Hotel, Milwaukee, was unique and most interesting. This meeting, with Chapter President W. J. MacNeill, Federal Malleable Co., presiding, was designed to honor the "Old Timers" and recognize the winners in the local apprentice contest.

Twenty-seven foundry veterans of fifty or more years' service were guests of the chapter and were introduced by Ed Borgnis, International Molding Machine Co. Twenty-four of the veterans are shown in the accompanying picture.

Another feature of the meeting was the awarding to the apprentices of the district prizes won in the local and national apprentice contests. Winners in the national contest were Marvin Bergstrom, Kearney & Trecker Mfg. Co.; Steve Garbowitz, Allis-Chalmers Mfg. Co.; Emmett Klessig, Wisconsin Aluminum Foundry Co., Manitowoc; and Robert Ashley, Waukesha Foundry Co. Bergstrom was a pattern competition winner while Garbowitz, Klessig and Ashley took all three prizes in the national competition in nonferrous molding. The prizes were presented by W. E. Watson, Jr., Allis-Chalmers Mfg. Co., who was chairman of the local apprentice contest committee.

After presenting a summary of the chapter activities for the past year, President MacNeill introduced the newly elected officers and directors, turning the meeting over to the new president, B. D. Claffey, General Malleable Corp. Others elected were: *vice president,* A. C. Ziebell, Universal Foundry Co., Oshkosh; *secretary,* Howard Waldron, Nordberg Mfg. Co.; *treasurer,* R. F. Jordan, Sterling Wheelbarrow Co., and *directors for three years,* Fred Pritzlaff, Falk Corp., and D. C. Zuege, Sivyer Steel Casting Co.

Before closing the meeting, President Claffey called on past president Roy Jacobs who presented to retiring president MacNeill on behalf of the chapter a gold ring designed for the chapter.

*Universal Foundry Co. and secretary, Wisconsin Chapter.

Old timers at Milwaukee meeting (above)—(Left to right, front row): George Klenk, Allis-Chalmers Mfg. Co.; James Rountree; Walter Adams, Donald Sales & Mfg. Co.; George Haberkorn, National Brake & Electric Co.; Andy Anderson; Joe Placzek; Ole Arneson, Arneson Foundry Co.; David McLain, McLain's System, Inc.; Tom Glasscott, Pickands Mather & Co.; Robert Ziebell, Universal Foundry Co.; Frank Becker, Becker Mfg. Co. (Left to right, back row): C. E. McArthur, Vilter Mfg. Co.; John Ryan, Allis-Chalmers Mfg. Co.; Eugene Kueny, Allis-Chalmers Mfg. Co.; Ed Freeman, G. J. Meyer Mfg. Co.; Martin Pusch, Allis-Chalmers Mfg. Co.; A. T. Helgerson, D. J. Murray Co.; Geo. Geiger, Allis-Chalmers Mfg. Co.; John Leisk, Allis-Chalmers Mfg. Co.; J. W. Chambers; A. J. Ricker, Badger Malleable & Mfg. Co.; Ed Borgnis, International Molding Machine Co.; J. J. McDevitt, S. Obermayer Co.; E. C. Gladfelter.

Apprentice contest winners at Milwaukee meeting (below)—(Left to right, front row): Harry Nowak, Maynard Steel Casting Co.; George Radulovich, Ampco Metal Co.; Lyle Grotelueschen, Chain Belt Co.; Wm. Watson, Jr. (chairman, apprentice contest committee); Marvin Bergstrom, Kearney & Trecker Corp.; Richard Albrecht, Allis-Chalmers Mfg. Co.; Robert Ashley, Waukesha Foundry Co. (Left to right, back row): Robert Jablonowski, Sivyer Steel Casting Co.; Melvin Crain, Allis-Chalmers Mfg. Co.; Phillip Karas, Allis-Chalmers Mfg. Co.; John Hayeland, Allis-Chalmers Mfg. Co.; Walter Wojciehowski, Harnischfeger Corp.; Steve Garbowitz, Allis-Chalmers Mfg. Co.; William Silber, Sivyer Steel Casting Co.; Kenneth Zinda, Allis-Chalmers Mfg. Co.; Emmett Klessig, Wisconsin Aluminum Foundry Co.

Old Timers

TWO of the "Old Timers" at the recent Wisconsin Chapter meeting, still active in the malleable industry are William F. Hoernke, malleable superintendent, Wisconsin Appleton Company, and Vincent Frank Gapinski, general superintendent, Milwaukee Malleable & Gray Iron Works. These men have a

total of 97 years' experience in the malleable industry and are believed to be the two oldest active superintendents in the middle west.

In April, 1890, Mr. Hoernke started as a coremaker at the Northwestern Malleable Iron Co. of Milwaukee and went through the various departments until 1898. He then went to work for the Stowell Co. as a molder. In 1926 the Stowell Co. went out of business and the Wisconsin Appleton Co. took over the foundry. Mr. Hoernke became the foundry superintendent of Wisconsin Appleton Co. and is still active in this capacity. This gives Mr. Hoernke a total of 50 years in the malleable industry of Wisconsin.

In 1893, Mr. Gapinski started his malleable career as a molder at the Wisconsin Malleable Iron Co. During the following years

Photo courtesy John Bing, A. P. Green Fire Brick Co.

Will Hoernke (left) and Frank Gapinski, two active old timers of the malleable industry.

Mr. Gapinski was employed at the Northwestern Malleable Iron Co. and the Deering Co. On January 2, 1901, Mr. Gapinski was employed by the Milwaukee Malleable & Gray Iron Works as foundry foreman and continued in this capacity until 1909, when he was made general superintendent, which position he still holds.

Central New York Chapter Holds Final Meeting

By L. D. Wright*, Geneva, N. Y.

THE last meeting of the Central New York chapter was held May 24 at the Onondoga Hotel with Chapter Chairman H. H. Judson, Goulds Pumps, Inc., presiding. Some 65 members and guests gathered for this meeting, which was both interesting and informative.

Following the dinner Chairman Judson introduced F. Ray Fleigh, Smith Facing and Supply Co., Cleveland, and newly elected Cleveland chapter chairman, who spoke on the subject "Foundry Facings—Their Manufacture and Application."

Mr. Fleig stated that the best plumbagos are manufactured from Ceylon graphite, the reason for this being that the graphite is crystalline in structure and this crystalline structure is not destroyed by grinding and the carbon content withstands a higher temperature than the graphite secured from other sources. The graphite obtained from other sources is porous and burns off readily.

The speaker also added that a great deal of the difficulty encountered by foundrymen with certain blackings was not due entirely to the blacking itself but to the structure of the blacking. A coarse graphite was recommended for green sand work. For core washes a low volatile content is necessary and, where these blackings were made soft in past years, they are now a harder material. The method of mixing a core wash is a very important matter. The mixing should be done the day before the blacking is to be used and should be mixed with a reciprocal motion. Where air is used to mix the blacking, the graphite is carried to the top by the air bubbles and will therefore cause a separation. The use of blackings will not give a smooth surface to the casting but will stop the sand from burning on.

The use of pitch as a core binder was described, the speaker stating that the proper temperature to bake pitch cores is 500°F. If the cores are not baked at the proper temperature, the pitch will come to the surface and stick to the casting at the time of pouring. A pitch core, when properly baked, will clean out of the casting very easily.

Following Mr. Fleig's address, G. M. Thrasher, R. Lavin & Sons, Elmira, presented the report of the Nominating Committee and, as there were no other nominations, the list of officers was elected unanimously. The officers and directors elected can be found in the chapter directory section of this issue.

*Secretary Central New York Chapter and superintendent, United States Radiator Corp.

Detroit Puts on Experts to Answer Questions

By O. E. Goudy,* Detroit, Mich.

AN innovation by the Detroit Chapter as a part of its final business meeting of the year was a very decided success. With Chapter Chairman H. W. Dietert presiding, the meeting was held at the Fort Shelby Hotel on May 16. The feature of the evening was a "Question and Answer" period when a committee of ten was chosen as best fitted to answer any and all foundry questions. The committee proved equal to the task and the affair was voted exceptionally educational as well as entertaining.

Present as guests were two apprentices, Jack Van Stone, General Motors Research Laboratories, and Jack Kress, Cadillac Motor Car Co. These two apprentices, winners in the local pattern-making contest, were awarded prizes by the chapter, with the presentation being made by Wayne Stettbacher, Employers Association of Detroit and chairman of the chapter apprentice committee.

*Met., Kelsey-Hayes Wheel Co. and Reporter for Detroit Chapter.

Some business reports were made which indicated that the chapter had an exceptional year of activities, ending with a favorable financial standing. The report of the nominating committee was acted upon and the following officers elected: *chairman,* Glenn Coley, Detroit Edison Co.; *vice chairman,* V. A. Crosby, Climax Molybdenum Co.; *secretary,* A. H. Allen, Penton Publishing Co.; *treasurer,* W. W. Bowring, F. B. Stevens, Inc.; *directors*—(3-year term) E. L. Morrison, Budd Wheel Co.; O. E. Goudy, Kelsey-Hayes Wheel Co.; A. L. Allen, Pontiac Motor Co., Pontiac; H. W. Dietert, Harry W. Dietert Co.; (2-year term) A. J. Gonter, Chrysler Corp.; R. G. McElwee, Vanadium Corp. of America; J. H. Crawley, Pontiac Motor Co., Pontiac; Howard McCoy, Cadillac Motor Car Co.; (1-year term) R. B. Crawford, Atlas Foundry Co.; F. J. Walls, International Nickel Co.; A. L. Boegehold, General Motors Research Division; F. A. Melmoth, Detroit Steel Casting Co.

Pittsburgh Association Completes Year with Safety Meeting and Outing

By R. L. Hartford,* Pittsburgh, Pa.

THE regular May meeting of the Pittsburgh Foundrymen's Association was held on May 20 at Clifford B. Connelly Vocational High School, Pittsburgh. This place was of particular interest since it contains a complete foundry, outfitted largely by the association a number of years ago and devoted to training boys in this district in preparation for work in the foundry industry. Before the dinner the members and guests, numbering about 135, inspected the school's foundry and watched some of the students engaged in various stages of castings manufacture under the direction of H. W. Dosey, foundry instructor.

At the regular meeting, held in the school auditorium, Dr. L. H. Turner, principal of the Trade School, welcomed the foundrymen. Safety was the subject up for discussion, and I. A. Brinkman, personnel and safety director, Mackintosh-Hemphill Co., delivered a paper on accident prevention, outlining the proper method of setting up a safety program including the allotment of responsibilities in their best places for most efficient results. Mr. Brinkman spent considerable time outlining the changes in Pennsylvania's industrial compensation act.

Chief discussion at this meeting centered around the work of Connelly trade school in the foundry field. Mr. Dosey appealed to the members of the association for co-operation in placing boys graduating from the foundry course each year, and the members decided to form a placement committee which will find jobs for every boy, insofar as possible. Several members cited the difficulties encountered in placing new men, even as apprentices, through opposition of the unions who insist upon seniority rights and the rehiring of former employes before new men are allowed to enter the business.

Dr. Turner invited the Association to make this meeting an annual affair. Chairman J. M. Stewart of the entertainment committee announced the details of the annual outing, which was held June 10.

Under the direction of Mr. Stewart and his committee, one of the most successful outings of recent years was held at South Hills Country Club. In point of attendance, it was the largest in the history of the Association, with 337 men, beating the previous high by some 25 persons. Golfers began their day early in the morning, with most of the crowd gathering late in the afternoon, when the foundrymen went down to inglorious defeat before the blitzkrieg attack of the supply men, 6 to 1. K. R. H. Nelson, Ferdinand G. Schultz Co., managed to get his "nothing-ball" past the foundrymen easily, while the salesmen made short work of the slants offered by C. J. Scheckhaus, twirler for the foundrymen. After a buffet supper, prizes were awarded by J. M. Stewart, Hickman-Williams Co., and chairman of the affair, aided by W. S. Scott, Pittsburgh Coke & Iron Co.

*Associate Editor, *The Foundry.*

Ontario Chapter Reviews Convention

By G. L. White,* Toronto, Ont.

THE last meeting of the Ontario Chapter for the current season was held on May 31st at the Royal York Hotel, Toronto, a meeting-place that was approved for the Toronto gatherings next season. The meeting got under way with Chapter Chairman D. J. MacDonald, Dominion Radiator and Boiler Company, Toronto, presiding, and in the course of proceedings the new chairman of the chapter, D. J. Storie, of Fittings, Ltd., Oshawa, Ont., took over the duties of office. Mr. Storie also introduced N. B. Clarke, Steel Company of Canada, Ltd., Hamilton, Ont., the new vice chairman. S. R. Francis, Metals and Alloys, Ltd., Toronto, is to carry on his good work as secretary.

In a short address as the retiring chairman, Mr. MacDonald pointed out that the rapidly increasing tempo of certain war industries might create a need for expanded inspection facilities which could possibly be supplied in part through the utilization of trained men available in the foundry industry. The matter was taken up with Ottawa, and it was believed that all members would be anxious to cooperate in any way possible. Referring to the past chapter year, Mr. MacDonald pictured the high level of activity that had

*Canadian Metals and Metallurgical Industries.

been maintained and paid tribute to the other officers of the chapter who had contributed so much to its success. He anticipated that the coming year would see the organization progress to new heights of attainment.

In taking over the chair, D. J. Storie spoke of the fine work of Mr. MacDonald, and of two retiring directors, J. Sully of Sully Brass Foundry, Ltd., Toronto, and W. J. Hall, Fahralloy, Canada, Ltd., Orillia, Ont.

Reviewing the highlights in gray iron at the A.F.A. Annual Convention, Chicago, J. C. Stavert, metallurgist, Babcock-Wilcox & Goldie-McCullough, Ltd., Ont., felt that great progress was being made in broadening the field of research and finding the fundamental reasons for metal properties. Metals, sands and cupolas are all objects of more intensive research. Covering malleable iron at the Convention, J. J. McFadyen, Galt Malleable Iron Co., Ltd., Galt, Ont., said that the relative scarcity of outstanding investigation in the field might be attributed to the fact that chemical control had to be introduced at an early stage in malleable iron manufacture, while the gray iron industry had more recently entered its great research programme. A non-ferrous programme which was characterized as well organized was reported by J. Sully. Papers of interest included those on melting procedures and one presenting a rather revolutionary method of top-pouring bronze. At the round table conference subjects of importance were the use of degasifiers, covers, etc., the effectiveness of certain very small additions in improving the aluminum bronzes and the substitution of silicon bronze for tin bronzes under the influence of higher tin prices. The field of scientific instruments at the Convention was reviewed by O. W. Ellis, Ontario Research Foundation. Some fine entertainment arranged for by the entertainment committee chairman, C. C. MacDonald, Frederic B. Stevens, Canada, Ltd., Toronto, rounded out an excellent program.

Radiography at Buffalo

By J. R. Wark*, Buffalo, N. Y.

THE May 17 meeting of the Buffalo Chapter, the last regular meeting, was held with Chapter Chairman W. J. Corbett, Atlas Steel Casting Co., presiding, and with some 75 members present. After a short entertainment period during which W. J. Wahl, an amateur magician, did some clever tricks, the technical meeting was held. The speaker of the evening was C. W. Briggs, technical adviser, Steel Founders' Society of America, Cleveland. Mr. Briggs, who is chairman of the A.F.A. committee on radiography, discussed the recent developments in radiography inspection and examination of castings. By means of slides he showed the Gamma-Ray Standards of the Navy Department Bureau of Engineering for steel castings for steam pressure service. He discussed the possibilities and limitations of such inspection and how the technical aspects of this tool were becoming more and more realized and used in steel foundries. Mr. Briggs' talk was considered outstanding in interest.

*Queen City Sand and Supply Co. and secretary, Buffalo Chapter.

Southern California Hears Reichert

By W. F. Haggman*, Huntington Park, Calif.

THE Southern California A.F.A. Chapter held its May meeting on the 17th at the Clark Hotel. Chairman A. G. Zima, International Nickel Co., presided. The speaker of the meeting was W. G. Reichert.

Some 70 members gathered to hear Mr. Reichert, metallurgist, American Brake Shoe & Foundry Co., Mahwah, N. J., one of the foremost authorities on sand. The speaker, who has written many papers for the association, chose as his subject "Foundry Sands." All those present agreed that a fine talk on this phase of the foundry industry was given, and the interesting and active discussion that followed showed the audience's great interest on this topic.

Norman McKay, Film Exhibitor Exchange, showed a most interesting motion picture on "Baseball," giving some "inside information" on big league ball players. Mr. McKay gave a brief history of baseball before presenting his film.

*Foundry Specialties Co. and secretary, Southern California Chapter.

St. Louis District Chapter Holds Annual Picnic

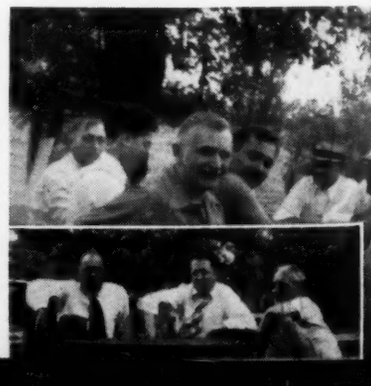
By J. W. Kelin*, St. Louis, Mo.

FOR the first time in years Jupiter Pluvius did not attend the annual picnic of the St. Louis District Chapter. The welcome absence of this universally unwanted guest helped to make the June 8th outdoor affair the finest attended in years. Held at Joe Davies' Country Club in Ferguson, Mo., the event was featured by real southern barbecue amplified by assorted good eats such as sausages, potato salad and all that goes with these toothsome delicacies. Assisting materially in the enjoyment were copious quantities of St. Louis beer.

Ball games, horseshoe games, tennis, fishing and other favorite outdoor pastimes were enjoyed throughout the day by all in attendance. Prizes were distributed during the afternoon to the fortunate ones. All in all the outing was a fitting climax to the fine work done by various members of the Entertainment Committee under the chairman-

*Federated Metals Division, A. S. & R. Co., and Secretary-Treasurer, St. Louis District Chapter, A.F.A.

St. Louis Outing—Group from Carondelet Foundry. (Insert left to right) Chapter Chairman W. Carter Bliss, Secretary Jack Kelin and Vice-chairman Louis Desparois.



ship of Charles E. Rothweiler, Hickman, Williams & Co.

Chapter chairman W. Carter Bliss, Scullin Steel Co., announced the appointment of standing committees for the coming year. These were as follows: *Program*—L. J. Desparois, chairman; Carl Morken, J. Walsch, A. S. Hard, H. Goodwin, Webb Kammerer; *Entertainment*—M. A. Bell, chairman; A. B. Woerheide, L. E. Everett, Chas. Rothweiler, Harold Wiese, H. E. Hostetter; *Apprentice Training*—George Mitsch, chairman; C. B. Shanley, W. F. McKee, Emil Goerger, Roy Jacobsen, Francis O'Hare; *Membership*—R. K. Durkan, chairman; John Williamson, Walter Zeise, R. Stifel, A. O. Nilles, Eric Warmber.

Northern California Holds Annual Meeting and Dinner

By G. L. Kennard*, San Francisco, Calif.

THE annual meeting of the Northern California Chapter was held June 14, Lake Merritt Hotel, Oakland, as the climax of an interesting and progressive year for the chapter. A new feature for a combination dinner meeting of business and pleasure was tried out, allowing everyone the opportunity of getting acquainted through predinner social contact, so that it was possible to have each lady decorated with a gardenia, and all guests seated at once for the preliminary course. This strategical play was made to have everyone at attention to hear a short address of welcome and a resume of the year's business given by chapter chairman S. D. Russell, who immediately thereafter called for the election of officers; when results were announced, each was asked to stand and make his bow.

The only speaker was our first chairman, Clarence M. Henderson, who briefly reviewed the life and purposes of the Association, and the plan to form localized groups known as chapters. Mr. Henderson complimented the chairman, his officers, directors and committees on their successful year, the increase in membership to 81, the condition of the treasury, which showed a substantial profit over last year's gain in both the general and entertainment fund.

The several committees had picked one of their group to present Mr. Russell with an electric mantel clock, with a suitably engraved plate attached, to serve as a constant reminder of his term of office, and his responsibility for attending future meetings when possible.

The officers elected to serve one year were: *chairman*, I. L. Johnson, Pacific Steel Casting Co., Berkeley; *vice chairman*, E. M. Welch, American Manganese Steel Div., American Brake Shoe & Foundry Co., Oakland; *secretary-treasurer*, G. L. Kennard, Northern California Foundrymen's Institute. The directors elected are shown in the chapter directory on page 18.

All business of the evening having been concluded, dancing and dining took up the time until the 9 o'clock floor show, which was one of the enjoyable features of the party, lasting about an hour. From then on, until the curfew rang, "they danced the hours away."

*Northern California Foundrymen's Institute and Secretary-Treasurer, Northern California Chapter.

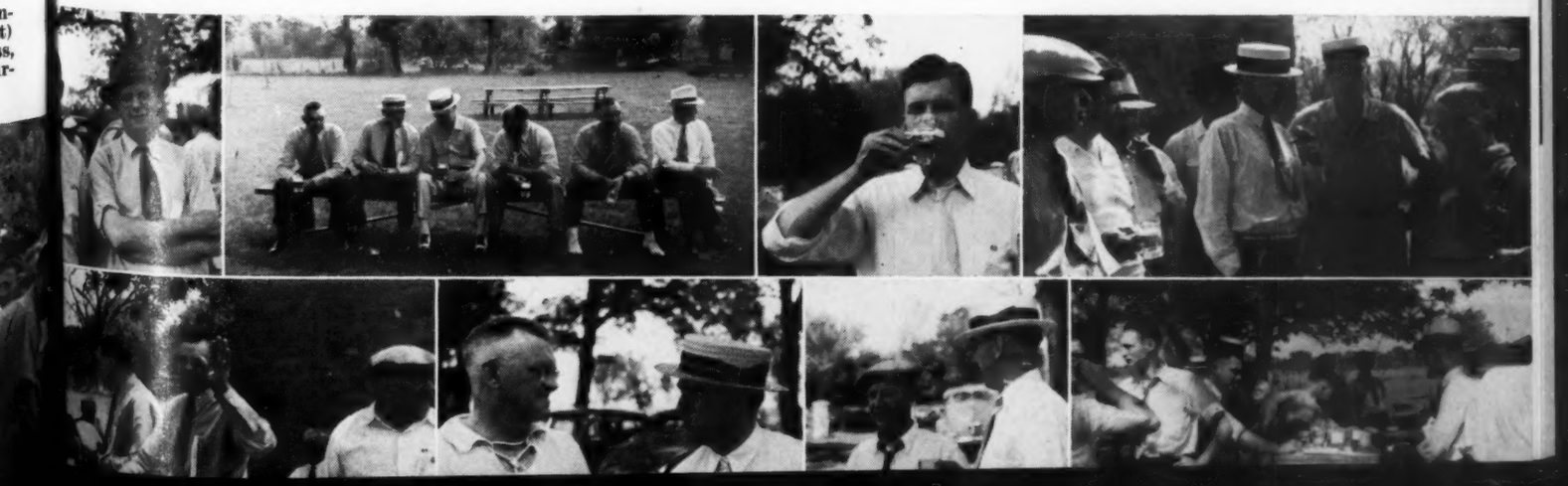
J. E. Riffer

1880—1940

The death on May 31 of J. E. Riffer, executive manager, St. Catharines Brass Works, Ltd. (St. Catharines, Ont.), was a great loss to the Association and to the Ontario Chapter. Born in Elmira, Ont., in 1880, Mr. Riffer, after being educated as a mechanical engineer, gained practical experience in foundries of the United States and Canada. In 1909 he went to St. Catharines, starting a non-ferrous foundry, and in 1916 he built the present St. Catharines Brass Works, Ltd. He was responsible for the first monel metal castings in Canada and in many other ventures led the way in the metallurgical work. As a member of the A.F.A. he was active in its work and was one of a group forming the Ontario Chapter. His daughter, Miss Esther Riffer, who had acted as secretary-treasurer for her father's concern, will continue the business as president and executive manager, being one of the very few women to be active head of a foundry organization.

Northern Illinois-Southern Wisconsin Chapter Enjoys Outing at Rockford

Photos Courtesy John Bing, A. P. Green Fire Brick Co.



CHAPTER DIRECTORY

Chicago Chapter

Chairman—G. P. Phillips, International Harvester Co.
Vice-Chairman—L. L. Henkel, Interlake Iron Corp.
Secretary—B. L. Simpson, National Engineering Co.
Treasurer—C. C. Kawin, C. C. Kawin Co.
Directors—H. K. Briggs, Miller & Co.
H. W. Johnson, Greenlee Foundry Co.
A. W. Gregg, Whiting Corp., Harvey.
W. C. Packard, National Engineering Co.
B. J. Aamodt, National Malleable & Steel Castings Co.
J. H. Abbott, Hickman, Williams & Co.
L. F. Lottier, Peoples Gas, Light & Coke Co.
L. H. Rudesill, Griffin Wheel Co.
H. A. Forsberg, Continental Roll & Steel Foundry Co., East Chicago, Ind.
M. J. Lefler, Western Foundry Co.
T. J. Magnuson, J. S. McCormick Co.
C. E. Westover, Burnside Steel Foundry Co.

Northeastern Ohio Chapter

President—F. Ray Fleig, Smith Facing & Supply Co.
Vice-President—F. J. Dost, Sterling Foundry Co., Wellington.
Secretary—B. F. Lambert, Diamond Alkali Co.
Treasurer—R. F. Lincoln, Osborn Mfg. Co.
Directors—S. N. Farmer, Sand Products Corp.
F. J. Opatrny, F. B. Stevens, Inc.
B. G. Parker, Youngstown Foundry & Machine Co., Youngstown.
Marcel Reymann, Atlantic Foundry Co., Akron.
S. P. Schloss, Superior Foundry Co.
Wm. J. Feth, Forrest City Foundries Co.
E. J. Hedlund, Urick Foundry Co., Erie, Pa.
J. C. Maher, Ohio Foundry Co.
L. P. Robinson, Werner G. Smith Co.
F. A. Stewart, National Malleable & Steel Castings Co.
Wm. E. Goebert, Bowler Foundry Co.
J. G. Goldie, Cleveland Trade School.
E. F. Hess, Ohio Injector Co., Wadsworth.
W. O. Larson, W. O. Larson Foundry Co., Grafton.
J. H. Tressler, Hickman, Williams & Co.

Quad City Chapter

Chairman — Nathan Lesser, Deere & Co., Moline, Ill.
Vice-Chairman—A. H. Putnam, A. H. Putnam Co., Rock Island.
Secretary - Treasurer — J. Morgan Johnson, Tri-City Manufacturers' Assn., Moline.
Directors—H. Bornstein, Deere & Co., Moline, Ill.
Frank W. Wells, J. I. Case Co., Rock Island.
F. O. Gorman, John Deere Spreader Works, East Moline.
P. T. Bancroft, Moline.
E. C. Wussow, Williams-White & Co., Moline.
J. H. Ploehn, French & Hecht, Inc., Davenport, Iowa.
A. E. Hageboeck, Frank Foundries Corp., Moline.
L. E. Roby, Peoria Malleable Castings Co., Peoria, Ill.
Ray Wendland, International Harvester Co., Rock Island.

Detroit Chapter

Chairman—Glenn Coley, Detroit-Edison Co.
Vice-Chairman—V. A. Crosby, Climax Molybdenum Co.
Secretary—A. H. Allen, "The Foundry."
Treasurer—Wm. W. Bowring, F. B. Stevens, Inc.
Directors—R. B. Crawford, Atlas Foundry Co.
F. J. Walls, International Nickel Co.
A. L. Boegehold, General Motors Research Div.
F. A. Melmoth, Detroit Steel Casting Co.
A. J. Gonter, Chrysler Corp.
R. G. McElwee, Vanadium Corp. of America.
J. H. Crawley, Pontiac Motor Co., Pontiac.
Howard McCoy, Cadillac Motor Car Co.
H. W. Dietert, Harry W. Dietert Co.
O. L. Allen, Pontiac Motor Co., Pontiac.
Otto E. Goudy, Kelsey-Hayes Wheel Co.
E. L. Morrison, Budd Wheel Co.

St. Louis District Chapter

Chairman—W. Carter Bliss, Scullin Steel Co.
Vice-Chairman—L. J. Desparois, Pickands, Mather & Co.
Secretary-Treasurer—J. W. Kelin, Federated Metals Div., A. S. & R. Co.
Directors—L. J. Filstead, John C. Kupferle Foundry Co.
R. K. Durkan, M. W. Warren Coke Co.
G. S. Haley, Century Foundry Co.
C. H. Morken, Carondelet Foundry Co.
L. C. Farquhar, American Steel Foundries, Granite City, Ill.
A. O. Nilles, Griffin Wheel Co., N. Kansas City, Kans.
Webb Kammerer, Midvale Mining & Mfg. Co.
L. E. Everett, Key Co.
Walter Zeis, Midwest Foundry Supply Co.
C. B. Shanley, Semi-Steel Casting Co.
George Mitsch, American Car & Foundry Co.
C. E. Rothweiler, Hickman, Williams & Co.

Metropolitan Philadelphia Chapter

Chairman—R. J. Keeley, Ajax Metal Co.
Vice-Chairman—H. Reitinger, U. S. Pipe & Foundry Co., Burlington, N. J.
Secretary-Treasurer—W. B. Coleman, W. B. Coleman & Co.
Directors—Lee Harris, Link Belt Co.
John H. S. Spencer, H. W. Butterworth & Sons.
M. R. Taggart, Taggart & Co.
John M. Robb, Jr., Hickman, Williams & Co.
Douglas J. Peake, Florence Pipe Foundry & Machine Co., Florence, N. J.
J. T. Fegley, North Bros. Mfg. Co.
W. C. Hartman, Bethlehem Steel Co., Bethlehem.

Wisconsin Chapter

President—B. D. Claffey, General Malleable Corp., Waukesha.
Vice-President—A. C. Ziebell, Universal Foundry Co., Oshkosh.
Secretary—Howard Waldron, Nordberg Mfg. Co., Milwaukee.
Treasurer—R. F. Jordan, Sterling Wheelbarrow Co., Milwaukee.
Directors—W. J. MacNeill, Federal Malleable Corp., West Allis.
Ray Flansburg, Belle City Malleable Iron Co., Racine.
Harry Donald, Interstate Supply & Equipment Co., Milwaukee.
Harry Ladwig, Allis-Chalmers Mfg. Co., West Allis.
T. E. Ward, Badger Malleable & Mfg. Co., South Milwaukee.
David Zuege, Sivyer Steel Casting Co., Milwaukee.
Fred Pritzlaff, Falk Corp, Milwaukee.

Northern California Chapter

Chairman—I. L. Johnson, Pacific Steel Casting Co., Berkeley.
Vice-Chairman—E. M. Welch, American Manganese Steel Co., Oakland.
Secretary-Treasurer—G. L. Kennard, Northern California Foundrymen's Institute, San Francisco.
Directors—A. W. Allen, San Francisco Stove Work, San Francisco.
Harry A. Bossi, H. C. Macaulay Foundry Co., Berkeley.
J. D. Fenstermacher, Columbia Steel Co., San Francisco.
Frank R. Geis, Metallurgical Laboratories, San Francisco.
John S. Fowler, Pacific Foundry Co., San Francisco.
J. L. Francis, Vulcan Foundry Co., Oakland.
B. C. Page, F. K. Simonds Co., Oakland.
P. C. Valentine, Del Monte Properties Co., San Francisco.

Birmingham District Chapter

Chairman—W. O. McMahon, Sloss-Sheffield Steel & Iron Co.
Vice-Chairman—J. A. Bowers, American Cast Iron Pipe Co.
Secretary-Treasurer—D. L. Booker, National Cast Iron Pipe Co.
Directors—R. R. Deas, Jr., American Cast Iron Pipe Co.
W. E. Curran, Republic Steel Corp.
C. B. Saunders, Tennessee Coal Iron & R. R. Co.
H. A. Newbury, Newbury Mfg. Co., Talladega.
A. S. Holberg, Alabama Clay Products Co.
R. L. Ogden, Stockham Pipe Fittings Co.

H. J. Noble, American Cast Iron Pipe Co.
W. Carson Adams, Adams, Rowe & Norman.
G. E. Jones, U. S. Pipe & Foundry Co., Bessemer.
Geo. M. Morrow, Jr., Goslin-Birmingham Mfg. Co.

Buffalo Chapter

Chairman—John McCallum, McCallum-Hatch Bronze Co.
Vice-Chairman—R. K. Glass, Republic Steel Corp.
Secretary-Treasurer—Eliot Armstrong, Inter-Allied Foundries.
Directors—Jos. Mayer, Lumen Bearing Co.
W. S. Miller, C. C. Kawin Co.
John Reid, The Symington Co., Rochester.
J. P. Begley, Pratt & Letchworth Co.
Alex Rankin, Lake Erie Engineering Corp.
R. D. Loesch, Lake Erie Foundry Co.
Jos. Kaufman, Harrison Division, General Motors Corp, Lockport.
W. J. Corbett, Atlas Steel Casting Co.

Southern California Chapter

Chairman—Jas. E. Eppley, Kinney Iron Works, Los Angeles.
Vice-Chairman—Glenn Merrefield, Warman Steel Castings Co., Los Angeles.
Secretary—W. F. Haggman, Foundry Specialties Co., Huntington Park.
Treasurer—Earl Anderson, Enterprise Foundry Co., Los Angeles.
Directors — Pasquale Arpea, Axelson Mfg. Co., Los Angeles.
J. G. Eberhardt, Kay - Brunner Steel Products, Inc., Alhambra.
Thomas J. McGraw, Jas. E. McGraw & Son, Brea.
R. J. Crichton, American Brake Shoe & Foundry Co., Los Angeles.
B. G. Emmett, Los Angeles Steel Casting Co., Los Angeles.
James O'Hara, Fraters Valve & Fittings Co., Los Angeles.
A. M. Barker, Barker Foundry Supply Co., Los Angeles.
H. E. McGowan, H. E. McGowan Co., Los Angeles.
A. G. Zima, International Nickel Co., Los Angeles.

Metropolitan New York-New Jersey Chapter

Chairman—R. J. Allen, Worthington Pump & Machinery Co., Harrison, N. J.
Vice-Chairman—J. W. Reid, Robins Conveying Belt Co., Passaic, N. J.
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Treasurer—R. E. Nesbitt, Pratt Institute, Brooklyn, N. Y.
Directors—G. Hochgesang, American Brake Shoe & Foundry Co., Mahwah, N. J.
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Sam Tour, Lucius Pitkin, Inc., New York City.
W. C. Schulte, Rutgers University, New Brunswick, N. J.
K. A. DeLonge, International Nickel Co., New York City.
K. V. Wheeler, American Steel Casting Co., Newark, N. J.
L. A. Klever, Taylor-Wharton Iron & Steel Co., Highbridge, N. J.
H. G. Lamker, Wright Aeronautical Corp., Paterson, N. J.
D. Polderman, Jr., Whiting Corp., New York City.
N. E. Woldman, Eclipse Aviation Corp., Bendix, N. J.

Northern Illinois-Southern Wisconsin Chapter

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Vice-Chairman—H. C. Winte, Fairbanks Morse & Co., Beloit, Wis.
Secretary-Treasurer—R. W. Mattison, Mattison Machine Works, Rockford.
Technical Secretary—J. R. Cochran, Sundstrand Machine Tool Co., Rockford.
Directors—W. L. Davey, W. L. Davey Pump Co., Rockford.
H. F. Halverson, Beloit Foundry Co., Beloit, Wis.
C. M. Dale, Liberty Foundries Co., Rockford.
Eli Johnson, Greenlee Bros. & Co., Rockford.
Harry J. Wade, Fairbanks Morse & Co., Beloit, Wis.
John T. Clausen, Greenlee Bros. & Co., Rockford.
G. J. Landstrom, Sundstrand Machine Tool Co., Rockford.
C. V. Nass, Fairbanks Morse & Co., Beloit, Wis.
F. N. Rundquist, Beloit Iron Work, Beloit, Wis.

Ontario Chapter

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Assistant Secretary—R. Banks, Metals & Alloys, Ltd., Toronto.
Directors—O. W. Ellis, Ontario Research Foundation, Toronto.
W. R. Barnes, W. R. Barnes & Co., Hamilton.
J. J. McFadyen, Galt Malleable Iron Co., Galt.
John Thwaites, Beatty Bros., Ltd., Fergus.
John Reid, Canadian Westinghouse Co., Ltd., Hamilton.
C. C. MacDonald, F. B. Stevens, Inc., Toronto.
J. C. Stavert, Babcock-Wilcox & Goldie-McCulloch, Ltd., Galt.
N. C. MacPhee, McKinnon Industries, Ltd., St. Catharine.
T. A. Rice, International Harvester Co., Hamilton.

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Vice-Chairman—E. C. Bumke, Oliver Farm Equipment Co., South Bend.
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Directors—A. C. Arbogast, Northern Indiana Brass Co., Elkhart.
W. A. Bachman, New York Central Railroad, Elkhart.
A. J. Rumely, LaPorte Foundry Co., LaPorte, Ind.
W. A. Schlosser, Argos Foundry Co., Plymouth.
R. J. McSherry, Studebaker Corp., South Bend.
O. A. Pfaff, American Foundry Equipment Co., Mishawaka.
George E. Stoll, Bendix Products Corp., South Bend.
B. J. Voll, Sibley Machine & Foundry Co., South Bend.
J. E. Drain, Oliver Farm Equipment Co., South Bend.
S. W. Howard, Weil - McLain Co., Michigan City.
F. T. McGuire, Sibley Machine & Foundry Co., South Bend.
R. E. Patterson, Elkhart Foundry & Machine Co., Elkhart.

Central New York Chapter

Chairman—Frank C. Wheeler, Kimman & Wheeler, Syracuse.
Vice-Chairman—E. J. Bair, Sr., Utica Radiator Corp., Utica.
Secretary—L. D. Wright, U. S. Radiator Corp., Geneva.
Treasurer—N. H. Boardman, Elmira Foundry Co., Elmira.
Directors—J. L. Lonergan, Morris Machine Works, Baldwinsville.
G. M. Thrasher, R. Lavin & Sons, Elmira.
W. Jones, International Heater Co., Utica.
F. F. Shortsleeve, Elmira.
Leo P. Fedegan, International Harvester Co., Auburn.
H. H. Judson, Goulds Pumps, Inc., Seneca Falls.
A. C. Davis, Cornell University, Ithaca.
C. M. Fletcher, Fairbanks Co., Binghamton.

Cincinnati District Chapter

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Vice-Chairman—W. M. Ball, Jr., Edna Brass Mfg. Co.
Secretary—Henry M. Wood, W. W. Sly Mfg. Co.
Treasurer—L. A. Gosiger, S. Obermayer Co.
Directors—Earl H. Thompson, H. P. Deuscher Co., Hamilton.
Robert Frankl, Superior Pattern Co.
Charles C. Erhart, Chas. Erhart Foundry Co.
E. F. Loges, Kramer Bros., Foundry, Dayton.
Herman K. Ewig, Cincinnati Milling Machine Co.
Frank Hutchinson, Reliance Foundry Co.
Herschel Kautz, Cincinnati Milling Machine Co.
J. W. Nichols, Ingersol Rand Co.

Central Indiana Chapter

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Vice-Chairman—B. E. Gavin, National Malleable & Steel Castings Co., Indianapolis.
Treasurer—J. P. Lentz, International Harvester Co., Indianapolis.
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Directors—R. L. McIlvaine, Swayne-Robinson Co., Richmond.
E. G. Schmidt, Jr., International Harvester Co., Indianapolis.
B. P. Mulcahy, Citizens' Gas & Coke Utility, Indianapolis.
L. M. McAnly, Rockwood Mfg. Co., Indianapolis.
M. B. Falvey, Hoosier Iron Works, Kokomo.
L. E. Davis, Republic Coal & Coke Co., Terre Haute.
S. A. Norrick, Perfect Circle Co., New Castle.
S. C. Wasson, National Malleable & Steel Castings Co., Indianapolis.
H. B. Harvey, Indiana Foundry Corp., Muncie.
C. M. Hardy, Hougland & Hardy, Inc., Evansville.

NEW MEMBERS

In the June issue some 76 new members were reported as enrolled from April 15 to May 3. This month it is especially pleasing to report 112 enrolled up to June 11. Many of these came in as a result of the membership drive, initiated by President Shannon and carried through by the committee of 100 under the chairmanship of Past President James L. Wick, Jr., and with the cooperation of the chapter membership committees. It is gratifying to note how the work of the Association and its chapters is being recognized through its increase of membership which increase is constantly setting new records.

Birmingham Chapter

Julien W. Adams, Works Mgr. & Consulting Engr., Goslin-Birmingham Mfg. Co., Birmingham, Ala.
E. H. Feely, Foreman, Central Foundry Co., Holt, Ala.
Clyde E. Hagler, Gen'l Supt., Continental Gin Co., Birmingham, Ala.
J. Elbert Johnson, Repr., Alabama By-Products Corp., Birmingham, Ala.
Lasco Jones, Foreman, Central Foundry Co., Holt, Alabama.
W. J. Jones, Foreman, Central Foundry Co., Holt, Alabama.
Ray Long, Stockham Pipe Fittings Co., Birmingham, Ala.
Roy H. Norris, Jr., Repr., Alabama By-Products Corp., Birmingham, Ala.
Howard Payton, Core Maker, American Cast Iron Pipe Co., North Birmingham, Ala.
E. G. Spradley, Central Foundry Co., Holt, Ala.
L. O. Stone, Melting Foreman, U. S. Pipe & Foundry Co., North Birmingham, Ala.
Victor A. Szwed, Plant Engr., U. S. Pipe & Foundry Co., North Birmingham, Ala.
J. F. Wakeland, Fdry. Supt., Marshall Stove Co., Lewisburg, Tenn.
Oscar C. Warren, Industrial Mgr., Birmingham Gas Co., Birmingham, Ala.

Buffalo Chapter

R. L. Cleland, Eastern Mgr., Eastern Clay Products Co., Buffalo, N. Y.
R. L. Cleland, Jr., Salesman, Eastern Clay Products Co., Buffalo, N. Y.

Central Indiana Chapter

Thomas L. Kemp, General Mgr., Citizens Gas & Coke Utility, Indianapolis, Ind.

Central New York Chapter

Arthur Batzold, Supt., Southern Wheel Div., American Brake Shoe & Foundry Co., Rochester, N. Y.
J. B. Connor, Supt., Southern Wheel Div., American Brake Shoe & Foundry Co., Sayre, Pa.

Chicago Chapter

Chicago Mfg. & Distributing Co., Chicago, Ill. (Thos. L. Adas, Mgr.)*
A. W. Cormier, Dist. Sales Mgr., Bay State Abrasive Products Co., Chicago, Ill.
Orville Cost, Vice-President, Mexico Refractories Co., Chicago, Ill.
Gerald M. Dennis, Sales Engr., Whiting Corporation, Chicago, Ill.
Drying Systems, Inc., Chicago, Ill. (B. B. Russell, President)*
C. McA. Evans, Secretary, Chicago Steel Foundry Co., Chicago, Ill.
W. C. Hitchins, Fdry. Supt., The Pyle National Co., Chicago, Ill.
Hammond Brass Company, Hammond, Ind. (J. F. Lammering, Vice-President)*
Hodgson Foundry Company, Chicago, Ill. (J. W. Hodgson, President)*
W. McManus, Sales, E. F. Houghton & Co., Chicago, Ill.
E. H. Nielsen, Erecting Supt., Whiting Corporation, Chicago, Ill.
Archie Stoker, Foreman, Sivyer Steel Casting Co., Chicago, Ill.
E. Walcher, Jr., Operating Dept., American Steel Foundries, Chicago, Ill.
Wm. Wertz, Asst. Foreman, W. D. Allen Mfg. Co., Chicago, Ill.

Cincinnati Chapter

Carl M. Lyons, Supt., American Rolling Mill Co., Ashland, Ky.
Howard Ramsey, Salesman, The Werner G. Smith Co., Columbus, Ohio.

Detroit Chapter

A. H. Allen, Detroit Editor, "The Foundry," Penton Publishing Co., Detroit, Mich.
Frank H. Dodge, Repr., The Werner G. Smith Co., Detroit, Mich.
Harry G. McMurry, Cupola Foreman, Buick Motor Co. Div., General Motors Corp., Detroit, Mich.
R. L. Orth, Sales Engr., American Foundry Equipment Co., Detroit, Mich.

Metropolitan New York Chapter

J. F. Ahrens, Eastern Mgr., "The Foundry," Penton Publishing Co., New York, N. Y.
John J. Fitzgibbon, Fdry. Engr., International Nickel Co., Bayonne, N. J.
George Ladd Junior Met., Wright Aeronautical Corp., Engineering Dept., Paterson, N. J.

Metropolitan Philadelphia Chapter

Chas. A. Sleicher, Iron Fdry. Supt., Cramp Brass & Iron Fdry. Co., Div. of Baldwin Locomotive Wks., Baldwin, Pa.
S. R. Vanderbeck, Philadelphia, Pa., Sales, Whiting Corporation, Harvey, Ill.

Michiana Chapter

L. K. Newell Elkhart, Ind., Sales, The Reliable Pattern & Castings Co., Cincinnati, Ohio.

Northeastern Ohio Chapter

The Cuyahoga Foundry Co., Cuyahoga Heights, Ohio. (James V. Proshek, President)*
Russell Duer, Piqua, Ohio, Sales Rep., American Foundry Equipment Co.
W. J. Feth, Fdry. Supt., Forest City Foundries Co., Cleveland, Ohio.
General Implement Co., Cleveland, Ohio. (M. W. Wimmer, Vice-President)*

*Company Members.

H. C. LeBeau Jr., Asst. Met. Engr., Ohio Injector Co., Wadsworth, Ohio.
A. E. McFadden, Fdry. Supt., International Stacey Corp., Delaware, Ohio.
W. E. Rayel, Sales Repr., The Werner G. Smith Co., Cleveland, Ohio.
Emil J. Romans, Foreman, National Malleable & Steel Castings Co., Cleveland, Ohio.
M. E. Rose West Steel Casting Co., Cleveland, Ohio.
Leslie Schuman, Foreman, National Malleable & Steel Castings Co., Cleveland, Ohio.
H. S. Stoller, Akron, Ohio, Sales Engr., F. E. Schundler & Co., Inc.
Ray E. Teach, Sales Repr., The Werner G. Smith Co., Cleveland, Ohio.
Henry J. Trenkamp, Sales Repr., The Ohio Foundry Co., Cleveland, Ohio.
Carlton L. Walker, Foreman, West Steel Casting Co., Cleveland, Ohio.
R. D. Walter, Metallurgist, The Werner G. Smith Co., Cleveland, Ohio.

Northern Illinois-Southern Wisconsin Chapter

C. S. Nielsen, Met. Engr., Geo. D. Roper Corp., Rockford, Ill.

Ontario Chapter

R. O. Denman, Managing Director, Chromium Mining & Smelting Corp., Ltd., Hamilton, Ont., Canada.
John Inglis Co., Limited, Toronto, Ont. (J. H. Clark, Foreman, Pattern Shop)*
L. H. Westwood, Sales Engr., Darling Bros., Ltd., Toronto, Ont., Canada.
Carl O. Williamson, Supt., Grinnell Co. of Canada, Ltd., Toronto, Ont., Canada.

Quad-City Chapter

Homer L. Burg, Owner, Purity Molding Sand Co., Dallas City, Ill.
Richard Hoover, Supv., International Harvester Co., Rock Island, Ill.
W. E. Jones, Fdry. Foreman, The Bettendorf Co., Bettendorf, Iowa.
Thos. Kuberski, Apprentice (Fdry.), John Deere Spreader Works, East Moline, Ill.
Frank McCubbins, Supv., International Harvester Co., Rock Island, Ill.
T. E. Spencer, Supt., Dexter Company, Fairfield, Iowa.
C. W. Wade, Factory Trg. Supv., Caterpillar Tractor Co., Peoria, Ill.

St. Louis Chapter

Binkley Mfg. Co., Warrenton, Mo. (C. R. Pieper, Vice-Pres. & Prod. Mgr.)*
Charles F. Ludwig, Richmond Heights, Mo., Repr., American Foundry Equipment Co., Mishawaka, Indiana.
Mexico Refractories Co., Mexico, Mo. (C. E. Sharp)*

Southern California Chapter

Earle R. Andrews, Sales Repr., Chamberlain Co., Los Angeles, Calif.
Robert J. Hicks, General Metals Corp., Western Malleable Plant, Los Angeles, Calif.

*Company Members.

Wisconsin Chapter

Edwin John Gallagher, Sales Repr., Republic Steel Corp., Milwaukee, Wis.
O. J. Heupler, Sales Engr., Harnischfeger Corp., Milwaukee, Wis.
C. W. Larsen, Repr., Corn Products Sales Co., Milwaukee, Wis.
LeRoy F. Nohling, Fdry. Foreman, The Frost Company, Kenosha, Wis.
Wm. Range, Fdry. Supt., Kohler Company, Kohler, Wisconsin.
Schwab Gilt Edge Furnace Mfg. Co., Cedar Grove, Wis. (Mark P. Ohlsen, Pres.)*

Outside of Chapters

Chas. L. Benham, Dist. Sales Mgr., American Foundry Equipment Co., Springfield, Mass.
Alfred J. Brisbois, Purch. Agent, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich.
Geo. Cannon, Jr., Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.
The Connecticut Foundry Co., Rocky Hill, Conn. (A. O. Knudson, President)*
Geo. E. Detter, Supt., Gra-Iron Foundry, Marshalltown, Iowa.
D. S. Dubash, Elec. Engr., American Express Co., Boston, Mass.
C. Dale Evans, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich.
Joseph S. Garske, Proprietor, Progress Pattern Co., St. Paul, Minn.
L. O. Gaskins, Supt., West Virginia Malleable Iron Co., Point Pleasant, W. Va.
Jos. W. Gibson, Service Engr., Herman Pneumatic Machine Co., Pittsburgh, Pa.
Manuel Goicoechea, Industrial & Consulting Engineer, Mexico City, Mexico.
James S. Guernsey, Clark Cast Steel Cement Co., Shelton, Conn.
Sam W. Healy, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich.
Henry T. Irwin, Jr., Treasurer, Rosedale Foundry & Machine Co., Pittsburgh, Pa.
L. L. Johnston, Service Engr., Herman Pneumatic Machine Co., Zelienople, Pa.
R. G. Kaveny, Sales Engr., Herman Pneumatic Machine Co., Pittsburgh, Pa.
D. E. Lehane, Met. Engr., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Robert Leicht, Winona Machine and Foundry Co., Winona, Minn.
E. C. Madson, Supt., Andersen Foundry Co., Bayport, Minn.
R. P. Morgan, Service Engr., Herman Pneumatic Machine Co., Springfield, Mass.
King R. H. Nelson, Mt. Lebanon, Pittsburgh, Pa., Repr., American Fdry. Equipment Co., Mishawaka, Ind.
T. A. Renkenberger, Works Mgr., Herman Pneumatic Machine Co., Zelienople, Pa.
Herbert F. Scobie, Instructor, Fdry. Practice, University of Minnesota, Minneapolis, Minn.
C. W. Weedfall, Fdry. Engr., Saginaw Malleable Iron Division, General Motors Corp., Saginaw Mich.
Harold Wallis, Works Mgr., American Steel Foundries, Verona, Pa.
Eric Weiss, Director, Foundry Services, Inc., Birmingham, 7.—England.

Sustaining Members

A SUSTAINING Membership in the A.F.A. presents an opportunity for companies to support the Association in proportion to benefits accruing and their desire to further the aims and purposes of A.F.A.

It is generally recognized that companies are the greatest beneficiaries through application of practical knowledge obtained by members of their organizations to daily operations. In many associations of companies there is a differential in cost of membership based either on number of employees or tonnage produced. This is not practical in an association whose membership includes both employer and employee working together for their mutual advancement.

Amendments to the Bylaws, creating a class of sustaining membership, make possible a differential between large and small operators that will provide funds for supporting activities which A.F.A., on behalf of the foundry industry, should support, such as molding sand research, management problems, industrial relations, apprentice training, foundry cost, industrial safety and hygiene, fair workmen's compensation rates, and the promotion of the use of cast products in industry as exemplified by the Cast Metals Handbook.

During the past year forty-eight companies have availed themselves of sustaining memberships, thirty-seven of them contributing $100.00 or more. It is with sincere appreciation that we publish their names, expressing the hope that many more will elect to support Association activities through subscribing to this class of membership with the beginning of the new year, July 1:

Ajax Metal Co., Philadelphia, Pa.
American Air Filter Co., Louisville, Ky.
American Cast Iron Pipe Co., Birmingham, Ala.
American Foundry Equipment Co., Mishawaka, Ind.
American Laundry Machinery Co., Rochester, N. Y.
American Steel Foundries, Chicago, Ill.
C. O. Bartlett & Snow Co., Cleveland, O.
Beardsley & Piper Co., Chicago, Ill.
Belle City Malleable Iron Co., Racine, Wis.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.
Canadian Bronze Co., Ltd., Montreal, Que., Canada.
Carondelet Foundry Co., St. Louis, Mo.
Chevrolet Gray Iron Foundry, Saginaw, Mich.
Deere & Co., Moline, Ill.
Falcon Bronze Co., Youngstown, O.
Falk Corporation, Milwaukee, Wis.
Foundry Equipment Co., Cleveland, O.
Frank Foundries Corp., Moline, Ill.
Fulton Foundry & Machine Co., Cleveland, O.
General Malleable Corp., Waukesha, Wis.
Great Lakes Foundry Sand Co., Detroit, Mich.
Herman Pneumatic Machine Co., Pittsburgh, Pa.
Hill & Griffith Co., Cincinnati, O.
International Harvester Co., Chicago, Ill.
International Nickel Co., New York City.
Lake City Malleable Iron Co., Cleveland, O.
National Engineering Co., Chicago, Ill.
Ohio Brass Co., Mansfield, O.
Osborn Mfg. Co., Cleveland, O.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Co., Cleveland, O.
Penton Publishing Co., Cleveland, O.
Plainville Casting Co., Plainville, Conn.
Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.
Claude B. Schneible Co., Chicago, Ill.
Sivyer Steel Casting Co., Milwaukee, Wis.
W. W. Sly Mfg. Co., Cleveland, O.
Werner G. Smith Co., Cleveland, O.
Stockham Pipe Fittings Co., Birmingham, Ala.
Tabor Mfg. Co., Philadelphia, Pa.
Unit-Cast Corp., Toledo, O.
Vanadium Corp. of America, New York City.
West Michigan Steel Foundry Co., Muskegon, Mich.
Whiting Corp., Harvey, Ill.
Wisconsin Steel Co., Chicago, Ill.

Cupola Research Committee

(Continued from page 7)

W. Levi, Lynchburg Foundry Co., Lynchburg, Va.
John Lowe, Vilter Mfg. Co., Milwaukee, Wis.
J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.
M. F. Milligan, Lunkenheimer Co., Cincinnati, Ohio.
L. B. Thomas (Alt: L. Seamans), Campbell Wyant & Cannon Fdry. Co., Muskegon.
F. J. Walls, International Nickel Co., Detroit, Mich.
R. E. Wilke, John Deere Tractor Co., Waterloo, Ia.

(6) Subcommittee on Refractories (Cooperating with Joint Committee on Foundry Refractories)—*(Chairman)* C. S. Reed, Jr.

J. A. Kayser, Laclede-Christy Clay Products Co., St. Louis, Mo. *(Vice Chairman).*
C. E. Bales, Ironton Fire Brick Co., Ironton, O.
M. C. Booze (Alt: K. W. Smith), Chas. Taylor Sons Co., Cincinnati, O.
J. O. Everhart, Kentucky Fire Brick Co., Haldeman, Ky.
L. C. Hewitt, Laclede-Christy Clay Products Co., St. Louis, Mo.
J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.
P. J. May (Alt: H. G. Leibold), Cleveland Quarries Co., Cleveland, O.
R. S. Moore, Harbison-Walker Refractories Co., Pittsburgh, Pa.
J. D. Sullivan, Battelle Memorial Institute, Columbus, O.

ABSTRACTS

NOTE: The following references to articles dealing with the many phases of the foundry industry, have been prepared by the staff of *American Foundryman*, from current technical and trade publications.

When copies of the complete articles are desired, photostat copies may be obtained from the Engineering Societies Library, 29 W. 39th Street, New York, N. Y.

Aluminum Alloys

HEAT TREATING. *"Heat-Treatable Aluminum Alloys,"* by L. W. Kempf, *Metal Industry* (London), April 5, 1940, vol. 36, no. 14, pp. 312-314. This article is part of a comprehensive paper on the commercial application of precipitation hardening effects in aluminum alloys. This paper tells of the composition and properties of those heat-treatable aluminum alloys used in this country. Among some of the alloys discussed are the aluminum-magnesium type, aluminum-copper type, aluminum-magnesium-silicide type and aluminum-zinc and aluminum - copper - magnesium - zinc type. (A1.)

Apprentice Training

SYSTEMS. *"Training Systems Pay Dividends,"* by Edwin Bremer, *The Foundry*, vol. 68, no. 5, May, 1940, pp. 92-94, 175-176. Two important developments have re-directed attention to apprentice training: (1) the transition of the foundry industry from an art to a science and (2) the recent upward trend of the demand for foundry products. Seeing the benefits derived from a good training program, the Carondelet Foundry Co., St. Louis, inaugurated a system whereby they could develop salesmen and foundrymen and at the same time give pointers to their employees through a lecture course system. Separate courses were provided; the first two for developing foundrymen and salesmen included an intensive training in foundry practice and its allied phases, while the third was designed to provide apprentices, molders and foremen with extended knowledge on fundamental principles of melting, gating and risering, cast iron metallurgy, etc., through a series of lectures that took one evening a week for eight months. (Tr.)

Casting

LOSSES. *"Changes Methods to Reduce Cylinder Casting Loss,"* by John E. Olson, *The Foundry*, vol. 68, no. 5, May, 1940, pp. 88-89, 171, 172-173, 174. This article describes the solution to a cylinder casting problem that was very successful in decreasing scrap losses and increasing production. These cylinders varied in pouring weight from 350 to 4300 lbs., in size from 8 to 24-inch bore, in length from 2½ to 6 feet and in sidewall metal thickness from ½ to 1½ inches. They were water-jacketed so to be able to stand temperatures and pressures found in internal combustion gas and oil engines and held to rigid dimensional specifications for accurate and efficient operation. Castings were to be free from surface defects, clean, readily machinable and sufficiently dense and free from porosity for a high pressure water test. (C.)

Cast Iron

DIES. *"Dies of Cast Iron,"* by Richard Bredenbeck, *The Iron Age*, vol. 145, no. 20, May 16, 1940, pp. 38-39. High tensile cast irons are receiving increasing recognition as a die material. Today it is both practical and possible to build high grade draw or forming dies in which nothing else is used but high tensile iron. The theory has been advanced in this particular shop that such iron, when properly hardened, ground and polished, helps to eliminate "pick-up," one of the worst enemies of the die-maker. The ability to flame harden high tensile irons successfully is also discussed by the author. From the shop experience of this company it has been proved that there are quite enough substantial advantages to be gained by the extensive use of high tensile iron in the manufacture of metal stamping dies for any die-maker to give it thorough and careful consideration. (C.I.)

FOUNDRY PRACTICE. *"Gray Iron Foundry Practice,"* by C. H. Lorig and V. H. Schnee, *The Foundry*, vol. 68, no. 5, May, 1940, pp. 90-91, 161, 164, 166. The growing interest in production and use of better grades of gray cast iron is shown in the amount of material in the technical press dealing with this subject. This is a resume of the mass of papers, pamphlets, booklets, etc., that calls attention to new developments and shop practices in many foundries at home and abroad. This review covers the important subject of foundry practice and contains material that has been published during 1938-39. (C.I.)

HISTORICAL. *"Historical Survey of Iron,"* *Foundry Trade Journal*, vol. 61, no. 1219, December 28, 1939, p. 441. Early uses and the present day developments in iron are surveyed in this article. Beginning with the years B.C., it is shown how iron has gradually been improved and processed until today the industry itself is one of the largest and most widely known in the world. Real activity in the iron industry took its turn during the nineteenth century when new and numerous fields were opened; since this time the manufacture and processing of iron has taken rapid strides in improvement and development. (C.I.)

LADLE ADDITIONS. *"Influence of Ladle Additions on the Properties of Cast Iron,"* by E. Piwowarsky, *Foundry Trade Journal*, vol. 62, no. 1237, May 2, 1940, pp. 325-327. This paper was not written with the intention to ascertain what ladle additions and amounts have the best effect on the properties of the iron, but to find out what changes in structure are produced in a series of high-carbon and low-carbon melts by adding the usual ladle additions, such as ferro-silicon, calcium-silicon, etc., and in what way such additions affect mechanical properties. The cupola is used in this experiment as the melting furnace. Preliminary work was done with cupola iron tested in the electric furnace. (C.I.)

LADLE ADDITIONS. *"Influence of Ladle Additions on the Properties of Cast Iron,"* by E. Piwowarsky, *Foundry Trade Journal*, vol. 1238, no. 62, May 9, 1940, pp. 350, 352. Various types and styles of test pieces were used in this experiment such as transverse test bars, impact test pieces, notched and unnotched; hot-strength test pieces, shrinkage cavity bars, etc. All these were studied for their structure. These experiments showed that the more strongly hypo-eutectic a cast iron is, the more does the graphite incline to adopt a recticular arrangement. When allowed to solidify quietly a globulitic primary structure is generally formed. (C.I.)

PROPERTIES. *"Cast Irons,"* by C. H. Lorig, *Product Engineering*, vol. 11, no. 5, May, 1940, pp. 209-212. Much development has been done in the casting industry and it will continue to expand since new developments will continue to come at an ever increasing rate because an ever increasing amount of energy and thought is being given to the matter. During the past few years, there has been a general movement toward making better irons without alloying. Mainly through the control of carbon and silicon content and with a growing appreciation of the influence of structure on the properties of irons, unalloyed irons are now being made consistently, in some foundries, with strengths well over 40,000 lb. per sq. in. The author discusses in detail abrasion resisting irons, endurance, superheated irons, and effects of sulphur. Better foundry controls are also pointed out as a benefit to aid in the production of cast iron. (C.I.)

Core Blowing

FUNDAMENTALS. *"Fundamentals of Core Blowing,"* by R. F. Lincoln, *The Foundry*, March, 1940, vol. 68, no. 3, pp. 34-36, 94, 97-98. This is the second and concluding article by the author on the problems encountered in the operation of core blowing machines. This discussion pertains to what probably is the most important part of the entire rigging, namely, the size, type and location of the vents. (P.)

Enamelling

CAST IRON. *"Some Principles of the Enamelling of Cast Iron,"* by G. T. O. Martin, *Foundry Trade Journal*, vol. 62, no. 1233, April 4, 1940, pp. 260-262, 264. This paper is confined to cast iron enamelling. For convenience, it is proposed to consider the question under three headings: (1) effect of metal, (2) effect of the enamel and (3) effect of the application process. The relation between the iron and the enamel has been studied before, but the third factor has received hardly any attention. The author points out that since the causes of vitreous enamelling faults are frequently well recognized, the best way to prevent them from arising would be to take suitable precautions against them. (C.I.)

Foundry Industry

ARMY ORDNANCE. *"The Foundry Industry and Army Ordnance,"* by Col. N. F. Ramsey, *The Foundry*, March, 1940, vol. 68, no. 3, pp. 28-29, 78, 81. This is a paper that was presented before the January meeting of the Wisconsin chapter of A.F.A. and deals with the foundry's importance in the casting of cannon. Dealing historically with facts, the author shows how strides were made in this country to develop cannon quality and quantity. The close of the Civil War found us with cannons of great merit, but was soon to find out that foreign powers were developing cannons better than ours. The development of the steel guns was pioneered by Col. Rogers Birnie. He was the first officer in this country to apply the principle of built-up guns and to apply modern methods in the construction of ordnance for the government. Theories developed by the late Col. Birnie have not been improved and the methods and formulas developed for gun shrinkage are still in use today. Dealing further into the indus-

try, the author takes up casting and construction of modern day field pieces and mobile units. (F.)

Furnace

HIGH TEMPERATURE. *"A Laboratory Gas Furnace for Very High Temperatures,"* by Vaughan H. Stott, *Foundry Trade Journal,* vol. 62, no. 1233, April 4, 1940, pp. 257-258. The furnace described herein was developed in the course of work on the sintering of alumina. Ease of which high temperatures are attained is due to the use of a burner in which the gas and air are so intimately mixed that combustion is very rapid, resulting in a high optimum gas consumption. The main features of the furnace are illustrated in a drawing included in the article. (F.)

Iron Castings

MACHINE TOOL. *"Making Better Machine-Tool Castings,"* by F. J. Dost, *Mechanical Engineering,* vol. 62, no. 5, May, 1940, pp. 365-369. Comparatively little work has been done by the machine-tool industry as a whole on the problem of wear resistance since the inception of high-strength iron. The intention of the author is to relate the experience of his company in improving the quality of machine-tool cast iron. The procedure followed in this study was to take microscopic specimens from the wearing surfaces of both the bed and the immediate sliding member of the machine in question, and to examine the structure at the actual wearing surface. A chemical analysis to correlate composition with this structure was also made. (C.)

Machining Allowances

CASTINGS. *"Machining Allowances on Castings," Foundry Trade Journal,* vol. 62, no. 1237, May 2, 1940, pp. 323-324. This discussion presented to foundrymen of the West Riding of Yorkshire Branch, I. B. F., by S. W. Wise, secretary, was on the question of machining allowances. He stated that due to variations of foundry practice and differences of opinions it would be difficult to provide a definite standard of tolerance. The problem of having excessive and insufficient amounts of metal for machining is also brought forth. Following Mr. Wise's comments a discussion follows that throws light on the subject from both the machinist and foundrymen's point of view. (C.)

Magnesium Alloys

CASTING PRACTICES. *"The Fabrication of Magnesium Alloys,"* by L. G. Day, *The Metal Industry* (London), vol. 36, no. 18, May 3, 1940, pp. 387-390. This article is the first of three in which the author, who is on the research staff of High Duty Alloys, Ltd., makes interesting comments on the methods employed by his company and the special apparatus they have devised. In this section of his paper he deals with the melting and sand casting procedure. These articles are based on a recent lecture delivered to the Midland Metallurgical Societies. (A1.)

Malleable Iron

HEAT TREATING. *"Malleable Cast Iron,"* by H. G. Hall, *Foundry Trade Journal,* vol. 62, no. 1232, March 28, 1940, pp. 237-239. In dealing with pearlitic malleable, this paper divides it into two classes as being produced by (1) stopping the annealing process before graphitization is complete, or (2) reheating completely graphitized metal. The author discusses the influence of various elements on the stability of iron carbide during casting and upon graphitization during annealing. An important section of the paper is devoted to a new special treatment of malleable iron called cyanide case-hardening, which produces an intensely hard surface suitable for resisting wear. In the last few paragraphs a study of raw materials and their melting has been made. (H.T.)

Management

MECHANIZING. *"Mechanizing the Foundry," Canada's Foundry Journal,* vol. 13, no. 4, April, 1940, pp. 26-27. Stated herein the chief requirement for a continuous mechanized plant is the production of a sufficient number of molds to take the metal from a continuously working cupola of practical size, or other continuous-melting unit. This is a study of just how a well planned and operated foundry would be run when properly equipped with mechanized units. The advantages for this type of foundry would be many, but the most important would be the regular and steady flow of both materials and products would tend not only to give a more orderly foundry, but to organize arrangements being made so that at the end of the day would find practically all the work ready for dispatch. (Mg.)

Non-Ferrous

CASTING TEMPERATURE. *"Casting Temperatures for Non-Ferrous Alloys," Iron Age,* vol. 145, no. 12, March 21, 1940, p. 45. This article was abstracted from the *Foundry Trade Journal* and tends to show that the effect of pouring temperatures on the production of bronze castings seems to be connected with the amount of gas present in the metal and the cooling rate required to maintain the gas in solution. Suitable pouring temperatures for some of the principal non-ferrous metals and alloys are shown in the accompanying table. A useful rule to be kept in mind for roughly determining the pouring temperature of sand cast articles is also given. (N.F.)

DEFECTS. *"Avoiding Defects in the Non-Ferrous Foundry,"* by N. K. B. Patch, *The Foundry,* March, 1940, vol. 68, no. 3, pp. 33, 102, 104, 106-107. This is the fourth and last in the series of articles by the author on avoiding defects in the non-ferrous foundry. Scum spots are discussed by the author telling how they are produced, what metals cause scum spots and how the problem can be corrected. High lead bronze compositions containing a certain per cent of lead have a defect called lead segregation. Also sponginess and improper distribution of the lead through the casting are defects found in this type of metal. Remedies for these faults are given by the author. Yellow brass castings and the tendency to leak are commented upon, giving methods of how to correct this defect. (N.F.)

DEFECTS. *"Avoiding Defects in the Non-Ferrous Foundry,"* by N. K. B. Patch, *The Foundry,* vol. 68, no. 5, May, 1940, pp. 95, 177-179. In discussing defects of the non-ferrous foundry the author has pointed out the causes and means of correcting such things as surface stains, scabs, misruns, metallic inclusions, improperly designed patterns and blow holes. The author states, from the data set forth, that it is evident that a number of variables influence the number of defective castings. Whenever possible every detailed operation in the production of castings should be so standardized that absolute uniformity of practice is the rule. (N.F.)

MELTING. *"Melting Operations in the Non-Ferrous Foundry,"* Frank Hudson, *Metal Industry* (London), March 22 1940, vol. 36, no. 12, pp. 265-268. Fundamental problems underlying melting operations in the non-ferrous metals foundry are the principles the author deals with in this paper. The main source of difficulty is attributed to hydrogen pick-up, and methods of avoiding gas absorption in the melting of brass and gun-metal are discussed. (Me.)

MELTING. *"Melting Operations in the Non-Ferrous Foundry,"* by Frank Hudson, *Metal Industry* (London), vol. 36, no. 13, March 29, 1940, pp. 291-294. In this paper, which was read before the Lancashire Branch of the Institute of British Foundrymen, the author deals with the fundamental problems underlying melting operations in the non-ferrous foundry. In this concluding installment of the paper, the examination of gunmetal casting is continued and the melting of bronze is dealt with. (N.F.)

Non-Ferrous Casting

CONTINUOUS. *"Continuous Casting,"* by T. W. Lippert, *Iron Age,* April 4, 1940, vol. 145, no. 14, pp. 31-39. Detailed descriptions are given of the various continuous casting units now in commercial production or undergoing extensive experimentation, some of these include Junghans, Williams, Eldred, Poland, Aluminum Co. of America, and a few other processes. The end product of such machines are either billets or ingots. (C.)

CONTINUOUS. *"Continuous Casting,"* by T. W. Lippert, *Iron Age,* April 11, 1940, vol. 145, no. 15, pp. 44-47. This article gives a review of recent machines for continuously casting or turning out strip as an end product. Particular attention is given to a new high speed unit for alloy steels. Most of the last section of this continued article centers around the new Hazelett ring mill, although some details on other methods are included. (C.)

Refractories—Non-Ferrous

INDUCTION FURNACE. *"Use of Refractories in Melting Copper and Copper Alloys in an Ajax-Wyatt Induction Furnace,"* by Seaver H. Booth, *The Bulletin, American Ceramic Society,* vol. 19, no. 5, May, 1940, pp. 171-172. A description is given in this paper of the construction and operation of the Ajax-Wyatt induction furnace used to melt copper and copper alloys. The refractory parts are described as well as the problems which occur through refractory failures. Recommendations are made, and the composition is given for an alumina cement that has been found to give satisfactory service. (F.)

Safety

PROGRAM. *"Safety Always Pays,"* by G. W. Cannon, *Steel,* vol. 106, no. 20, May 13, 1940, pp. 46-48. This company saved 50 per cent in insurance costs and with its detailed safety and hygiene campaign covering the plant and all employees, it reduced the visiting nurses' calls 50 per cent. The savings that the company netted during its "good housekeeping" program paid for the entire campaign. (Se.)

Sand Control

DEFORMATION. *"Sand Testing with Special Reference to Deformation,"* by Wm. Y. Buchanan, *Foundry Trade*

Journal, March 14, 1940, vol. 62, no. 1230, pp. 199-202. In this paper the author shows deformation is definitely related to the percentage flowability as expressed by the methods put by him in this paper. Deformation should be used as a method of judging mixing efficiency. The article shows that the deformation test is useful and a good figure for normal practice should be easily established. Through his conducting these experiments the A.F.A. compression test is affected by flowability, and this should be taken into account when assessing the value of such variables as moisture, milling, grain size, grain distribution and bond. (Sa.)

Spectroscopic Analysis

METHODS. *"Modern Analysis in the Foundry,"* by George W. Zabel and John Schuch, *The Iron Age,* vol. 145, no. 18, May 2, 1940, pp. 31-37. A laboratory staff requiring the services of three men, a foundry apprentice who tests molding sands, the mechanical sand handling equipment and core sand mixtures; the laboratory head who conducts the spectrographic analysis also supervises the research work that is being carried on by the sand tester and a third man who operates the carbon and sulphur determinators on incoming samples and assists the spectroscopists in the final stages of the spectrographic analyses, has been established by Fairbanks, Morse & Co. The combustion-type carbon and sulphur determinators, and the spectroscope equipment in Fairbanks, Morse & Co. foundry analyzes plain and alloy cast iron, aluminum, manganese bronze and brass, with precision, despatch and economy. (T.)

Steel

DAMPING CAPACITY. *"The Damping Capacity of Steel and Its Measurement,"* by G. P. Contractor and F. C. Thompson, *Iron and Steel Institute Paper,* no. 1/1940 of the Alloy Steels Research Committee, May, 1940, pp. 1-45. The Foppl-Pertz apparatus for the measurement of damping capacity was found to yield unduly high values, chiefly due to frictional losses between the stylus and the recording medium. The instrument was modified to eliminate this by employing an optical recording device. Particular attention has been paid to the effect on damping capacity of initial stress, bending, size and shape of specimen, etc. This experiment has been conducted to study the influence of moderate temperatures on the damping capacity of a series of typical steels. (S.)

ELECTRIC MELTING. *"Some of the Chemistry of Electric Steel Melting,"* by Adolph J. Schneid, Jr., *Metal Progress,* vol. 37, no. 5, May, 1940, pp. 527-532. This is a resume of the talk given by Charles H. Herty during March at Battelle Memorial Institute where melters of electric steel had gathered to hear a series of lectures. This article contains fundamentals of the chemistry of both acid and basic practice and falls in the class of those having to do with the fundamental chemistry of steel making. Mr. Herty stated that much had been written about the dynamics and thermal effects of reactions assumed to be taking place at 2700 to 3100° F., but that these equilibria were only one of four general actions that must be recognized: (1) solubility, (2) reactions and equilibrium, (3) diffusion and (4) flotation. Each one of these fundamental actions is discussed individually. (Me.)

HYDROGEN EFFECTS. *"Hydrogen, Flakes and Shatter Cracks,"* by C. A. Zapffe and C. E. Sims, *Metals and Alloys,* vol. 11, no. 5, May, 1940, pp. 145-151. Some alloys are very sensitive to hydrogen and consequently it is not easy to make hydrogen analyses. However, all we do know, aside from the various behaviors that are ascribable to hydrogen, is that most metals have some opportunity to pick up hydrogen in processing and that many of them do pick it up in undetermined amounts. More attention needs to be paid to hydrogen. As is shown in this article, a good deal of attention has been given to this subject but not much has been put into practice in the shops. (S.)

HYDROGEN ESTIMATION. *"The Estimation of Hydrogen in Steel and Other Metals,"* by W. C. Newell, *Iron and Steel Institute Paper,* no. 1/1940 Oxygen Sub-Committee, Heterogenity of Steel Ingots Committee, May, 1940, pp. 1-11. This is the development of the vacuum-heating method of estimating hydrogen in metals, particularly in steels. The theoretical basis of the method is discussed and a description of an apparatus designed for the study of the hydrogen control of metals is given, together with results of tests upon the method itself and upon metal samples. The rate of evaluation of hydrogen from steel at various temperatures has been studied, and shown that the amount of hydrogen given off by vacuum-heating is equivalent to the vacuum-fusion process. (S.)

Steel Casting

COST. *"Steel Casting Costs,"* by H. L. McClees, *Steel,* vol. 106, no. 20, May 13, 1940, pp. 70-71. The proper design of the steel casting, or any other metal casting, itself is most important for minimizing the cost. Proper pattern equipment is also essential. The utmost cooperation between user and producer of the castings will also aid in low production costs. (S.)

Steel Melting

OPEN HEARTH. *Operators Debate Open Hearth Problems," The Iron Age,* vol. 145, no. 18, May 2, 1940, pp. 51-56. Five major problems were discussed during the meeting of the Open Hearth Committee of the A.I.M.E. These problems were: Refractories, Maintenance of Furnace Walls, Hot-Top Compounds, Etc.; Construction and Operation of Basic Open Hearth Roofs, Use of Sinter in Blast Furnace Burdens, Hot Metal Requirements for Today's Open Hearth and Use of Carbanalyzer; The Leeka Process for Carbon Determination. Taking these various meetings as a whole, the information and discussions that were involved brought up many points that were beneficial and valuable. Each session had its respective questions to present and the interest shown in these problems is illustrated in the published results. (S.)

Steel, Open-Hearth

REFRACTORIES. *"Trends in Refractories for the Basic Open-Hearth Furnace,"* by R. P. Heur, *Metals and Alloys,* vol. 11, no. 5, May, 1940, pp. 152-155. It is shown in this article that although it was thought that completely basic furnaces were impractical due to basic brick having less life than silica, a new conclusion will have to be drawn because of recent developments with small European furnaces. Experience with copper smelting reverbratory furnaces also show that basic roof shoulders are more economical than silica arches throughout. New developments with suspended basic roofs are also pointed out. The chrome-magnesite brick in relation to iron oxide attack is discussed. A few points are given on how to reduce the lost time on the furnace due to repairs and rebuilds. The author also comments on the economy of a basic roof in comparison with one of silica. (S.)

TEMPERATURE MEASUREMENT. *"Measuring Open-Hearth Bath Temperatures,"* by L. O. Sordahl and R. B. Sosman, *Steel,* vol. 106, no. 21, May 20, 1940, pp. 44-47. While a large number of various methods as dissolving-tube method, test-spoon method, bath-equalization method, etc., give readings that check closely, recording photocell equipment sighted through tube immersed in bath with air flow to keep tube clear is found most practical. It reads reproducibility temperature of any steel in basic or acid open hearths and in electric melting furnaces. System provides a permanent record, is easy to use, economical in first cost as well as maintenance. Equipment is rugged, portable and can be handled by a single operator. (S.)

Wisconsin Chapter Plans Outing in July

JULY 19 has been set as the date for the famous Wisconsin Chapter Summer Outing. This will be held at the New Ozaukee Country Club. Plans are under way for a golf tournament which will start at 9:00 in the morning. The dinner will be at 7:00 in the evening, this to be followed by an extensive floor show. As the affair will be limited to 300, it is requested that reservations be made immediately through R. F. Jordan, 7036 W. Wacker St., Milwaukee, Wis. The outing committee of the chapter is under the chairmanship of John Bing, A. P. Green Fire Brick Co. Other members of the committee are B. D. Claffey, General Malleable Corp.; H. E. Fellows, Milwaukee Foundry Equipment Co.; R. M. Jacobs, Standard Brass Works; W. J. MacNeill, Federal Malleable Co.; T. E. Ward, Badger Malleable & Mfg. Co.; W. F. Bornfleth, Cutler-Hammer, Inc.; Seward Shaver, Werner G. Smith Co.; R. F. Jordan, Sterling Wheelbarrow Co.; John Jarman, Allis-Chalmers Mfg. Co.; Walter Gerlinger, Walter Gerlinger, Inc.

FUNDAMENTAL FOUNDRY INFORMATION

A Partial List of Available A. F. A. Publications

BOUND VOLUMES OF TRANSACTIONS

Containing a wealth of material in papers and committee reports as presented before annual conventions. At present only 4 of these are available. The supplies are limited, but those which are available are for those most recent conventions when papers and reports have been most numerous and on problems and practices of current importance. These volumes are the foundation of any library of foundry reference books.

Publication No.	Years	No. Pages	Price to Members	Price to Non-Members
V47	1939	1030	$3.00	$15.00
V46	1938	950	3.00	15.00
V45	1937	850	3.00	10.00
V41	1933	608	2.00	6.00

Publication No. 7

Alloy Cast Irons. 200 pp. 6x9, cloth binding (1939). Price $3.00. To members $1.50.

A committee publication, designed to provide foundrymen, purchasers and potential users with comprehensive and authoritative information on the theory, applications, properties and production of alloy cast irons. Sections deal with (1) Metallurgical Theory of Effects of Alloying Elements, (2) Qualitative Effects of Alloys, (3) Quantitative Effects on Properties, (4) White and Chilled Alloy Irons, (5) Heat Treatment, (6) Foundry Practice, (7) Specific Applications, giving analysis, mechanical properties and service results of a wide variety of alloy cast irons used in commercial practice, and (8) Bibliography.

Publication No. 50

The Microscope in Elementary Cast Iron Metallurgy, by R. M. Allen.

143 pp. 6x9 preprint, 73 illustrations, (1939). Cloth binding. Price $3.00. To members $1.50.

A book containing material of lectures presented by the author before 1939 A.F.A. Convention. Designed to meet the needs of the shop man and student in understanding the microstructure of cast iron. Discusses the fundamentals of physical cast iron metallurgy, showing extensive illustrations of various types of structures. Outlines effect of forms of graphite, silicon, sulphur, manganese and phosphorus. A chapter is devoted to special cast irons such as white, chilled, malleable, alloy, special duty and heat treated. The chapter on the cast iron equilibrium diagram is easily understood. A major section is a detailed explanation of the microscope and technique of its use, together with the preparations of samples.

Publication No. 22

Testing and Grading Foundry Sands and Clays.

208 pp., 6x9, (1938, Fourth Edition). Cloth Binding. Price $4.00. Member's price $2.00.

Standards and tentative standards for testing and grading foundry sands and clays adopted by the A.F.A., as prepared by the Committee on Foundry Sand Research. Covers sampling, test methods for permeability, strength, fineness, mold hardness, dye absorption, sintering, core properties, methods for chemical analyses, and grading classifications. Equipment described.

Publication No. 36-26

Present Status of Foundry Sand Investigation and Control, by W. G. Reichert, (1935).

Price $1.00. Member's price $0.50.

This is a complete review of foundry sand control by a metallurgist who has established sand control in his plant on practical, economical basis. A publication which everyone connected in any way with the use of sands should have in his handy reference file. It shows how testing and grading methods should be applied, the essentials of sand control for molding and core rooms, the laboratory and the superintendent's office. Written in understandable style for the practical shop man, yet is of the greatest value to the foundry engineer.

Publication No. 35

Pearlitic Malleable Cast Iron.

An A.S.T.M. publication. 32 pp., 6x9, (1936). Price $0.60; to A.F.A. and A.S.T.M. members $0.35.

Compiled from various sources by a special committee of the A.S.T.M. Covers classification, producer's data on various classes and patent literature. Considered of much value to those interested because published data since 1923 is largely in patent papers.

Publication No. 39-11

Symposium on Steel Melting Practice.

84 pp. 6x9 preprint (1939). Heavy paper binding. Price $1.00. To members $0.50.

A compilation of six papers presented before the 1939 Convention, covering melting practices in the acid and basic open-hearth, acid and basic electric furnaces, the induction furnace and the converter shops. The basic open-hearth practice is treated by J. W. Porter, American Steel Foundries, the acid open-hearth by W. C. Harris, Birdsboro Steel Foundry & Machine Co., the basic electric furnace by C. W. Briggs, Steel Founders' Society of America, the acid electric furnace by W. Finster, Reading Steel Castings Div., American Chain & Cable Co., the induction furnace practice by G. F. Landgraf, Lebanon Steel Foundry, and converter practice by F. B. Skeates, Link-Belt Co. This is the first comprehensive survey of Steel Melting Practices in many years and gives much valuable information to anyone interested in this subject.